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CONTENTS OF PREVIOUS NUMBER

SEPTEMBER, 1931. NUMBER 3

Infections of the Middle Ear: Acute Systemic Infections from the Ear. Isidore Friesner, M.D., New York.

Antroscopic Diagnosis of Maxillary Sinusitis. Emanuel Simon, M.D., Albany, N. Y.

Why Ligate the Jugular Vein in Cases of Lateral Sinus Thrombosis? O. M. Rott, M.D., Spokane, Wash.

A Method of Measurement of Tinnitus Aurium. E. M. Josephson, M.D., New York.

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The Blood Picture in Otitic Infections. Harry Rosenwasser, M.D., and Nathan Rosenthal, M.D., New York.

Further Proof of the Regeneration of Mucous Membrane in the Human Antrum. Gregor McGregor, M.B., Toronto, Canada.

Sinusitis in a Series of Alcoholic Hallucinoses. William M. Dick, M.D., and C. N. Colbert, M.D., New York.

Clinical Notes:

Epidural Abscess Over the Tip of Pyramid, with Symptoms of the Fifth and Sixth Nerves: Report of Two Cases. Clarence H. Smith, M.D., New York.

A Meningocele Within the Middle Turbinate Discovered During an Operation on the Ethmoid, Resulting in Meningitis and Recovery. Gerald R. O'Brien, M.D., Brooklyn.

A Retractor for Use in Radical Operation on the Antrum. H. H. Amsden, M.D., Concord, N. H.

A New Shield for the Eyes and for Eyeglasses. Samuel L. Lemel, M.D., Cleveland.

Progress in Otolaryngology. Summaries of the Bibliographic Material Available in the Field of Otolaryngology:

The Paranasal Sinuses: Review of the Literature from Oct. 1, 1929, to Dec. 31, 1930. D. Campbell Smyth, M.D., Boston.

Plastic Surgery. J. Eastman Sheehan, M.D., New York.

Abstracts from Current Literature.

Society Transactions:

Chicago Laryngological and Otological Society.

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THE PRODUCTION OF VOICE AND SPEECH FOLLOWING TOTAL LARYNGECTOMY

EXERCISE AND PRACTICE FOR THE PRODUCTION OF THE PSEUDOVOICE *

W. WALLACE MORRISON, M.D.

NEW YORK

TABLE OF CONTENTS

Introduction
Laryngeal Prostheses; Artificial Larynges
The Pseudovoice
Production of Sound Without the Larynx
The True Buccal or Pseudowhispered Voice
The Pharyngeal Pseudovoice
The Esophageal and "Stomach" Pseudovoice
Therapy for the Production of the Pseudovoice
Summary and Conclusions.

INTRODUCTION

With the growing belief that the operative procedure most likely to lead to a cure for laryngeal cancer is total laryngectomy, there are in America and abroad a constantly increasing number of persons who have undergone the removal of their essential organ of voice and speech production. Those thus deprived of the voice are definitely handicapped in their social intercourse, and often find great difficulty in obtaining a means of livelihood. These considerations must present themselves to every person suffering from laryngeal cancer to whom total laryngectomy is recommended; they surely are in the mind of the surgeon who advises the procedure, although the latter knows that he necessarily destroys the voice in attempting to save the patient from a particularly horrible form of death.

The problem of such voiceless persons has engaged the minds of surgeons and laryngologists ever since Billroth performed the first successful operation of this kind in 1873. Chiari, Sörensen and others performed total laryngectomy in a number of cases; the operative mortality was exceedingly high, and recurrences with early death were

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common until the time of Gluck [1] who, with Sörensen, approached the problem of the operation from the point of view of the general surgeon, and so improved the technic and methods of after-treatment that operative deaths became uncommon, and actual cure of the cancer was obtained in almost half the patients operated on.

From the time of these pioneers until the present day, further improvements in the technic and after-care have been made by Durante,[2] Lewis [3] and MacKenty,[4] among others. The immediate operative mortality has been reduced to a level almost comparable with that of other major surgical procedures for cancer; postoperative complications have been diminished to a very low rate of incidence, and actual cure of the cancer has been obtained in 24 per cent of a collected series of 605 cases, as reported by Weber [5] in 1928. MacKenty reported 50 per cent of cures in his series of selected cases of intrinsic cancer. The operation of the pioneers had justly fallen into disrepute; that of the present day is being done more and more widely, with results that seem to justify the procedure fully.

LARYNGEAL PROSTHESES; ARTIFICIAL LARYNGES

The problem of aiding the constantly increasing number of persons who have been rendered voiceless, although cured of laryngeal cancer, has been approached from two different angles. The first of these, also the first in the chronological order of its invention, is that of the formation of voice and articulated speech by means of laryngeal prostheses, or artificial larynges. The idea for such a piece of apparatus apparently first arose with Czermak,[6] in 1859, while treating a patient rendered voiceless by a complete chronic stenosis of the larynx. Such cases are uncommon, and may arise following extensive injury to the larynx in deep cuts of the throat or other penetrating cervical wounds, after destruction of the laryngeal cartilages by suppurative, syphilitic or postroentgen perichondritis and after cricotracheotomy with complete stenosis of the laryngeal lumen. While the loss of voice in these cases is not due to total laryngectomy, they may be included within the scope of this paper because of the similarity in the problem presented and its solution.

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1. Gluck, T., and Sörensen, in Katz, Preysing and Blumfeld: Handbuch der speziellen Chirurgie des Ohres under der oberen Luftwege, Wurzburg, C. Kabisch, 1913, vol. 4, p. 1; Ztschr. f. Laryng., Rhin. **1**:190, 1909.

2. Durante, Francesco: Policlinico, January, 1904.

3. Lewis, Fielding: Ann. Otol., Rhin. & Laryng. **33**:359, 1924.

4. MacKenty, J. E.: Cancer of the Larynx, Arch. Otolaryng. **3**:205 (March) 1926; ibid. **3**:305 (April) 1926; Laryngeal Cancer, ibid. **9**:237 (March) 1929.

5. Weber, quoted by Kahler: Kehlkopfkrebs, in Denker and Kahler: Handbuch der Hals- Nasen- Ohrenheilkunde, Berlin, Julius Springer, 1929, vol. 5, p. 457.

6. Czermak: Sitzungsb. d. k. Akad. d. Wissenschaft., Wien, 1859, vol. 35.

Since the early time mentioned, many investigators have exercised their ingenuity in constructing prostheses; these included Brücke, Czerny, Eiselsberg, von Bruns, Störck, Wolff, Gottstein, Hochenegg, Gluck, Sörensen, Onodi, Casadesus, Diaz, Hinajar, MacKenty, and Fletcher and Wegel of the research laboratories of the Bell Telephone Company of America.

All such laryngeal prostheses are constructed on the following basic principles: A certain tone, of a pitch within the range of the normal speaking voice, is produced by the vibration of a reed within a tube, under the action either of the expiratory air current from the lungs of the patient by way of his tracheal cannula, or of an air current from some form of bellows or pump activated by the hand, arm or thoracic wall of the patient; such a tone has even been produced by a portable gramophone with a record of the tone sung by a normal voice. However produced, the tone is conducted by means of a tube into the mouth, nose or nasopharynx of the patient, and employed by him for the production of the sounds of speech by his own movements of articulation and his organs of resonance.

More detail concerning these artificial larynges does not fall within the scope of this paper. None of them is necessary if the patient can produce a pseudovoice. All of them constructed up to the present time have disadvantages which may be summed up as follows (Seeman [7]): 1. All are merely prostheses, the use of which must serve to remind the patient constantly that he is not well. 2. The wearing of them is embarrassing, often burdensome and sometimes impracticable. 3. All are unreliable in their action; the most perfect are usually the most delicate and the most difficult of repair; the sudden failure of the apparatus on which the patient depends for all vocal communication with his fellows may cause him great anxiety, or even leave him helpless in the midst of danger to himself or those about him. 4. Almost all produce a voice that is monotonous, unnatural and almost entirely lacking in the melodic modulation of normal speech. 5. Some of the forms with tracheal cannulas may tend to cause local recurrence of cancer from prolonged irritation.

THE PSEUDOVOICE

The second means of producing voice and speech after total laryngectomy and in patients with an airtight, chronic stenosis of the laryngeal lumen is that of the production of certain sounds and their formation into audible speech without the use of a prosthesis and with the patient's own organs—the pseudovoice. This term will be employed throughout the paper to denote the voice so formed, in contradistinction to the normal

7. Seeman, Miltiades: Arch. f. klin. Chir. **140**:285, 1926.

voice produced with the larynx. While the possibility of the production of the pseudovoice has been known since Czermak's description of one of the first recorded cases, it is only within the past two decades that the realization has come that it is possible to educate almost all of these voiceless patients to use their own organs for the production of a pseudovoice—that there is therapy to be applied in such cases. It is with the development of this therapy that this paper is concerned.

Czermak's [6] case was that of a young girl with complete laryngeal stenosis who produced speech, faintly and imperfectly, while vital respiration was carried on independently through a tracheotomy opening. Sound was produced by the vibration of air in the mouth and pharynx, owing to muscular action, and the sounds were articulated into syllables in a more or less normal manner by the lips, tongue, teeth and palate. Störck [8] was apparently the first to publish, with Gersuny, a case of pseudovoice produced following total laryngectomy for cancer. A similar case, reported by Shmid of Stettin, was investigated fully by Strübing and Landois.[9] Seiler [10] also published an early case. A patient whose larynx had been totally removed by Mikulicz was referred to Gottstein,[11] one of the pioneers in the then entirely new therapy directed toward the production of the pseudovoice, under whose guidance truly brilliant results were obtained. Not only did the patient learn to speak with great distinctness, but his new voice was capable of such modulation that he could sing within the range of almost an octave.

Following the technical advances in total laryngectomy mentioned, the operation was performed more and more often. The development of the pseudovoice therapy also advanced materially, so that in 1908, Gutzmann, senior,[12] was able to report twenty-five cases in which intelligible speech had been obtained without the larynx. Since that time a number of cases have been reported. Here one may mention the names of Burger and Kaiser,[13] Scripture,[14] Schilling and Binder,[15] Winter [16] and Lewis.[3] There should be recorded especially the names of the Gutzmanns, senior [12] and junior,[17] Seeman [7] and Stern,[18] by means of whose

8. Störck: Wien. med. Wchnschr. **37**:1631, 1887.
9. Strübing and Landois: Arch. f. klin. Chir. **38**:1431, 1889.
10. Seiler, C.: Phil. M. Times **18**:199, 1888.
11. Gottstein: Arch. f. klin. Chir. **62**:126, 1900.
12. Gutzmann, H., Sr.: Ztschr. f. Laryng., Rhin. **1**:221, 1909.
13. Burger, H., and Kaiser, L.: Acta oto-laryng. **8**:90, 1925-1926.
14. Scripture, E. W.: J. Physiol. **50**:398, 1916.
15. Schilling, R., and Binder, H.: Arch. f. Ohren-, Nasen- u. Kehlkopfh. **115**: 235, 1926.
16. Winter, Pierre: Ann. d. mal. de l'oreille, du larynx **44**:917, 1925.
17. Gutzmann, H., Jr.: Deutsche med. Wchnschr. **51**:520, 1925.
18. Stern, Hugo: Wien. klin. Wchnschr. **33**:540, 1923; Zentralbl. f. Hals-, Nasen- u. Ohrenh. **3**:418, 1923; Ztschr. f. Laryng., Rhin. **12**:196, 1923.

endeavors this form of therapy has largely reached its present level of practicability and at least relative perfection.

From a study of the published cases a number of facts become apparent. First, it is obvious that there are several distinct types of production of pseudospeech. In order that certain basic facts may be clear, the four different types described by Stern[19] are given: (*a*) pseudowhispered speech or the true buccal voice, (*b*) pharyngeal pseudospeech, (*c*) esophageal pseudospeech and (*d*) "stomach" pseudospeech. These will be discussed in full detail later.

PRODUCTION OF SOUND WITHOUT THE LARYNX

A second fundamental consideration is that of the physiologic requirements and anatomic bases of the production of these different types of the pseudovoice. Clarity will doubtless be most easily attained if I first consider normal speech processes taking place with the larynx intact. In the normal production of a vocal sound and the molding of it into speech, the following factors are concerned: (*a*) the central nervous system in which the impulse to utter a sound arises, and which need not be considered further; (*b*) the lungs, which are the bellows furnishing a stream of air; (*c*) the larynx, in which the air current from the lungs is set into vibration by the glottis and a sound produced; (*d*) the organs of articulation, the tongue, hard and soft palate, lips, teeth, alveolar processes and floor of the mouth; by the action of this mechanism the laryngeal sound is changed into consonants; (*e*) the resonating chambers in the trachea, bronchi, larynx, pharynx, nose and mouth; by their action along with the articulatory mechanism, the vowels are formed.

One moment's thought concerning the laryngectomized patient, or one with a complete chronic stenosis of the larynx, makes it plain that he has lost the function of the larynx and the lungs, which can no longer act as the bellows to supply a current of air for phonatory purposes, as such air now passes out of the tracheotomy tube or tracheostoma. It is obviously fundamental, therefore, that in the production of the pseudovoice the lack of these two portions of the phonatory mechanism must be supplied by the creation of new mechanisms of similar function. Hence there must occur the formation of (*a*) a new, vicarious "lung," an air reservoir into which air can pass, and from which it can be expelled in such a way that the current so created can be set into vibration to produce an audible sound, and (*b*) a new, vicarious pseudoglottis in which the vibrations can actually be produced.

19. Stern: Der Mechanismus der Sprech- und Stimmbildung bei Laryngektomierten, und die derartigen Fällen angewandte Uebungstherapie, in Denker and Kahler: Handbuch der Hals- Nasen- u. Ohrenheilkunde, Berlin, Julius Springer, 1926, vol. 5, p. 494.

Before listing the possible sites of formation of the vicarious air chamber, I shall enumerate the requirements of such a chamber for its proper function: (*a*) It must be large enough to contain more than a few cubic centimeters of air. (*b*) It must be capable of being filled with air at a reasonably quick rate, voluntarily. (*c*) The contained air must be expelled again under the control of the will. (*d*) The current of air so expelled must be such that it will be set into vibration as it passes the pseudoglottis; this is a very important requirement, from which it seems obvious that the air chamber must lie below, i. e., caudal, to the pseudoglottis.

The possible sites of a vicarious air chamber possessing these qualifications in some degree at least are the mouth, the pharynx, particularly the hypopharynx, the esophagus as a whole, more especially its upper thoracic and cervical portions, and the cardiac end of the stomach, which normally contains air, the "stomach bubble" noted by German authors.

The requirements necessary for the proper function of the pseudoglottis are: (*a*) It must consist of some portions of the organ concerned that can be set into vibration by the air current passing out of the chamber below; hence it must lie above, i. e., cephalad, to the air chamber. (*b*) It must be a place that is, or that can be, constricted until the frequency of the vibrations of the passing air current is such that it will yield an audible sound. (*c*) It must be under the control of the will in some degree. (*d*) If the tension of the part or parts that vibrate can be changed at will, the pitch of the resultant sounds will be capable of modulation; this is fortunate, but not absolutely necessary for the mere production of the pseudovoice; it is an advantage much to be desired, however.

The sites at which the vicarious pseudoglottis can be formed, according to Stern,[19] are: (*a*) between the base of the tongue and the posterior wall of the pharynx; (*b*) between the back of the tongue and the tightly stretched velum; (*c*) between the strongly contracted posterior palatine arches of the two sides; (*d*) between contracted portions of the inferior constrictor muscle of the pharynx; (*e*) between the epiglottis and two folds formed laterally from the musculature of the pharynx; (*f*) at the upper hiatus of the esophagus, the esophageal mouth of Killian, between folds formed by the cricopharyngeus muscle; (*g*) in some cases there seems to be no real pseudoglottis, the patient merely employing the sound produced by the eructation of swallowed air for phonation; this will be more fully explained later.

Stern admitted that even with this extensive list all the possibilities of the location of the pseudoglottis are not exhausted. He pointed out that in many cases it is difficult to determine the site of the pseudo-

glottis, because of the difficulties of investigation. Many of the patients cannot produce any sound when the mouth is open sufficiently to permit mirror hypopharyngoscopy; others cannot produce the voice with the tongue protruded. Auscultation and external palpation will aid; roentgen examination usually fails because the folds concerned are too small to be thus visualized.

The site of the development of the pseudoglottis is determined by two factors, according to Stern.[19] The first of these is the location of the formation of the vicarious air chamber. This is in large part dependent, in turn, on the method of therapy practiced in an endeavor to produce the pseudovoice. The second factor is an important and practical one: the formation of the pseudoglottis as a result of certain local anatomico-physiologic conditions that prevail following total laryngectomy. By this is meant that if certain folds of mucous membrane or bands of muscle left behind at the operation are so situated that they can be set into vibration by a stream of air from below, such structures will probably form the pseudoglottis.

In this connection, it is interesting to note that Stern urged that in laryngectomy the surgeon should not heedlessly cut away any tissue, especially muscle, unless the extent of the cancer demands it; even small remnants may serve later as the pseudoglottis. This is of considerable importance, because few laryngeal surgeons realize that most of their laryngectomized patients can learn to produce a satisfactory pseudovoice; they should have the future needs of the patient in this respect in their minds during the operation.

Relative to this point, Seeman [7] made certain definite recommendations: 1. The cricopharyngeus muscle forming the esophageal mouth of Killian should be preserved as carefully as possible by gently dissecting its attachments to the cricoid plate; this is probably best accomplished by the mobilization of the larynx from below upward, and its complete skeletonization and dissection from the esophageal wall before the pharynx is opened. 2. The nerve supply of the upper portion of the esophagus should be carefully preserved, especially the esophageal rami of the vagi, and the recurrent laryngeal esophageal branches; unfortunately, it is not technically possible to save the external branches of the superior laryngeal nerves, which probably supply the cricopharyngeus muscle in large part. 3. The sternohyoid and thyrohyoid muscles should be preserved, because these aid in the action of the muscles attaching to the hyoid bone from above, which serve to draw the site of the larynx forward and upward; I shall discuss this action a little later. To allow it to take place most easily Seeman advised that the thyrohyoid muscles of the two sides be sutured to the anterior wall of the restored hypopharynx on the completion of the

laryngeal extirpation, and that the sternothyroid muscles also be sutured to it at the level of the esophageal mouth of Killian.

The possibility of the actual creation of a pseudoglottis within the hypopharynx by some plastic procedure as a part of the laryngectomy has suggested itself to several surgeons. Seemann stated that bands of mucosa and muscle so placed by the surgeon would almost certainly become immobile because of scar tissue formation, and that all attempts at the plastic construction of a pseudoglottis will probably fail. Stern is more hopeful, leaving the problem open for consideration by the surgeons of the future.

THE TRUE BUCCAL OR PSEUDOWHISPERED VOICE

The various forms of the pseudovoice have already been enumerated. The true buccal voice has also been called the "mouth voice," but in Stern's opinion it is best characterized by the term "pseudowhispered speech." This type of pseudovoice is formed on a basis of fricative, hissing or explosive sounds produced by the rather forcible expulsion of the air normally present within the mouth and pharynx, by the muscular elevation of the floor of the mouth and the base of the tongue and by the contraction of the pharyngeal walls. The sounds so produced are articulated into the consonants of the pseudowhisper. All the authors agree that true vowel sounds are not produced by this method; hence Seeman[7] called it "consonantal speech." In order that actual vowel sounds may be produced, the action of either the normal glottis or a pseudoglottis is necessary to form the basic tone which is made into the various vowel sounds by the action of the proper resonating chambers in the pharynx, nose and mouth. In this type of pseudovoice there is no real pseudoglottis; hence there is no basic tone production from which the vowels could be formed; it is sometimes called "toneless speech." Such attempts at vowel formation as do occur take place in conjunction with the production of the consonants with which vowels are usually associated in speech; the vowels are really merely "suggested," the consonantal sound passing on into the resonating chambers which have been subconsciously regulated to produce the vowel.

Although this is a consonantal speech, not all of the consonants are produced equally well. Those formed nearest the front of the mouth are loudest and most distinct because the air chamber producing the vibrations is largest; thus b and p are the best, and the fricative sounds f, sharp s, sch and hard ch are all good. D and t are less well formed as they are produced farther back in the mouth, while g, k and soft ch are poorly formed, as they are produced far back in the mouth. The sound w is like that of f; soft s is toneless, as is r. J resembles the hard ch. The sound m is an explosive b; n is like d, and h and v are produced only with great difficulty.

As Stern [19] pointed out, every patient who has had a laryngectomy learns to produce this type of pseudovoice without aid soon after the operative wound is healed. It is usually imperfect, toneless, hard to understand, audible only at short distances and tiring to the patient because of the effect needed to produce it. Further, as already explained, vowels cannot be produced, and many of the consonants are imperfect, so that this form of pseudospeech is unsatisfactory to the patient and his hearers. Stern further stated with considerable emphasis that he had found the acquisition of this feeble form of pseudospeech to be actually a hindrance to the learning of one of the other, more satisfactory forms. Once the patient has made a habit of the production of the pseudowhisper, it is very difficult for him to forget it and to learn a new and efficient method from the start. This point will be more fully discussed in the section on therapy.

THE PHARYNGEAL PSEUDOVOICE

True pharyngeal pseudovoice is defined as that in which there is an actual pseudoglottis lying within the oropharynx (mesopharynx) or laryngopharynx (hypopharynx) at one of the sites already listed The vicarious air chamber lies below the pseudoglottis, either in the depths of the hypopharynx in which the space has been increased because of the removal of the larynx or within the lumen of the esophagus. Air is caused to enter the hypopharyngeal chamber by relaxation of the walls and also by suction or swallowing movements, the latter being the more important factor. When the space is filled, the air is expelled through the pseudoglottis by voluntary muscular contraction of the pharyngeal walls with the production of a sound that can be converted into consonants and vowels; thus syllables and words are formed.

This type of pseudovoice is usually fairly satisfactory; the voice is rough, hoarse and rasping; the aspiration of air may be accompanied by an interfering sound. The voice is distinct if the patient articulates well. Both vowels and consonants are well formed. The voice is monotonous because the tension of the structures forming the pseudoglottis usually can be varied but little, and hence the pitch of the sounds produced can be changed only slightly. The pharyngeal pseudovoice and the other forms to be discussed will be satisfactory only if the patient learns the exceedingly difficult process of dissociation of the vital respiration, and the aspiration or swallowing of air with subsequent expulsion for phonation. This will also be more fully discussed in the consideration of therapy.

THE ESOPHAGEAL AND "STOMACH" PSEUDOVOICE

True esophageal pseudospeech is characterized by the fact that the entire mechanism of its production lies within the esophagus itself.

The pseudoglottis is at the mouth of the esophagus, while the vicarious air chamber is within its lumen at a lower level. Cases of this type were first described by Strübing and Landois,[9] Fränkel[20] and Gutzmann,[12] among others; however, it was Seeman[7] who first carefully investigated this mode of producing the pseudovoice. His studies led him to believe that the esophagus offered the anatomic and physiologic requirements for the most efficient production of the pseudovoice to a very high degree; he stated that he believed this to be the form to be striven for in any therapy directed toward the production of the pseudovoice.

The pseudoglottis is usually formed at, and by, the esophageal mouth of Killian. Killian's[21] careful anatomic and clinical investigation showed that the structure that actually forms the esophageal mouth, marking the level of separation of the esophageal lumen from that of the lowest hypopharynx, is the pars fundiformis of the cricopharyngeus muscle, which, in turn is composed of the lowermost fibers of the inferior constrictor of the pharynx. The fibers of the pars fundiformis run circularly around the circular muscular layer of the first, very short portion of the esophagus, like a sling with the anterior ends attaching to the lowermost and lateral parts of the plate of the cricoid cartilage on either side; the true esophageal mouth thus lies at the level of the inferior margin of the cricoid plate. The fibers form an actual sphincter, which is normally tightly and powerfully contracted, opening reflexly only at the moment of passage of material being swallowed or vomited, or during belching. Its real function, as Killian pointed out, is to prevent the regurgitation of material that has passed into lower parts of the esophagus during the contraction of those parts of the esophagus themselves. That it takes on a function so utterly different as that of a pseudoglottis seems strange until one considers that it is composed of striated muscle under at least partial control of the will, and that after laryngectomy with the freeing of the attachment of the fibers of the pars fundiformis from the cricoid plate, the latter lie as bands just beneath the mucosa and circular muscle layer of the esophagus, and can act as the "vocal cords" of the pseudoglottis.

What are the anatomic and physiologic conditions of the esophagus that render it favorable as a site for the development of a vicarious air chamber? It has been known for a long time that changes occur in the size of, and the air pressure within, the esophageal lumen. Mikulicz first showed that some of the changes were coincident with the respiratory movements; Brünings demonstrated experimentally that these

20. Fränkel, B.: Berl. klin. Wchnschr. **30**:758, 1893.
21. Killian, G.: Ztschr. f. Ohrenh. **55**:1, 1908.

were dependent on changes in intrathoracic pressure. In 1921, Stupka [22] described phonatory phenomena occurring at the esophageal mouth and in the upper part of the esophagus. These as well as the other changes in the esophageal lumen were extensively studied and graphically recorded by Seeman and by Dahmann.[23] The latter showed that there were changes in the lumen owing to: (*a*) the transmitted pulsation of the heart and aorta; (*b*) the respiratory movements (in the abdominal portion of the esophagus inspiration caused a narrowing, and expiration led to an expansion, while in the thoracic and cervical portions, inspiration caused an expansion, and expiration led to a contraction of the lumen); (*c*) the actions of swallowing, vomiting and belching, and (*d*) spasms of the wall of reflex origin. To these may be added (*e*) the phonatory phenomena more closely studied by Seeman,[7] who showed that the esophageal mouth contracted on phonation, and that there were similar contractions of the upper thoracic and cervical portions of the esophagus, independent of the changes due to the respiratory movements. Seeman pointed out that in the cervical and upper thoracic parts of the esophagus there is a considerable amount of striated muscle, supplied by the esophageal rami of the recurrent laryngeal nerves, capable of some voluntary control; the rest of the esophagus is of smooth muscle supplied by the vagus nerves, and entirely involuntary. Hence it would seem, as Seeman stated, that the esophagus is predestined to form the pseudovoice, on anatomic and physiologic grounds at least; there is an excellent basis for the pseudoglottis at the esophageal mouth, and the lumen of the upper thoracic and cervical portions can form an almost ideal vicarious air chamber.

Seeman's conception of the processes taking place during this type of production of a pseudovoice is as follows: He divided the occurrence of esophageal speech into two stages, the opening of the esophagus before phonation and its contraction during phonation. In the first stage, air can enter the esophagus in any considerable amount only if the tonic closure of the esophageal mouth is relaxed. This the laryngectomized patient must learn to do voluntarily; it is performed by the contraction of the muscles that lift up and pull forward the hyoid bone, that is, the geniohyoid, mylohyoid and anterior part of the digastric muscles; this action exerts a strong pull on the cricopharyngeus muscle at the esophageal mouth, causing it to relax. Simultaneously the patient must perform a short, jerking contraction of the diaphragm while the chest is held fixed, in order to cause negative pressure with the consequent inspiratory expansion of the upper part of the esophagus, so that air will enter the lumen of the esophagus in considerable

22. Stupka, W., quoted by Stern (footnote 18, third reference).
23. Dahmann, H.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **7**:329, 1924.

amount through the open esophageal mouth. This is usually accompanied by a noise like an eructation, owing to the sudden parting of the sticky esophageal walls; with constant practice the patient learns to perform this act with little effort and little interfering sound. In the second stage of this form of pseudovoice production, the air is driven out by the contraction of the muscular walls of the esophagus itself. These movements can be visualized by the use of barium sulphate and the fluoroscopic screen; they are at first spasmodic and cramplike but, in the course of time, become slower and more purposeful. They begin at the middle third of the esophagus and advance upward to the hypopharynx, forcing the air through the pseudoglottis at the esophageal mouth. The vibrations of air so created are employed for the production of the pseudovoice; the entire mechanism closely approaches the action of speech with the normal larynx.

One of the questions still unsolved regarding the pseudovoice is that of the possibility of the cardiac end of the stomach performing as the vicarious air chamber. Stern,[19] on the basis of about one hundred cases, came to certain conclusions which were opposed by Seeman. Stern stated that in almost all of his cases he could determine that air was aspirated into the cardiac end of the stomach before phonation, and expelled again during the production of the pseudovoice. He supported this claim largely by the demonstration of an enlarged air bubble in the stomach, as determined by measurements with the fluoroscopic screen, and by the unusually high position of the left dome of the diaphragm just before the patient begins to phonate; in some cases the stomach bubble definitely decreased in size, and the level of the left dome of the diaphragm dropped decidedly as the patient continued to phonate. Stern is supported in his belief by the published cases of Schilling and Binder,[15] Göbell,[24] Voorhoeve,[25] etc. Stern intimated that he could demonstrate an enlarged stomach bubble in more than half of his cases. He did not state that in all of these the air in the stomach bubble was employed for the production of the pseudovoice.

Seeman [7] assumed a decidedly opposing point of view. In an early series of four cases he saw none with an enlarged stomach bubble; all showed a vicarious air chamber in the upper esophagus. In a series of twenty cases, up to May, 1929, he saw an enlarged stomach bubble in three patients only. He insisted that it occurred by mechanical aerophagy in the following manner: Air aspirated into the esophagus and not at once expelled for phonation is further aspirated into the stomach at the next respiratory movement. In no case did Seeman find any

24. Göbell: Deutsche med. Wchnschr. **50**:1234, 1924.

25. Voorhoeve, N.: Acta radiol. **7**:587, 1926.

evidence that this air was forced back again into the esophagus for the purposes of phonation. This difference of opinion has not as yet been settled.

The "stomach" pseudovoice is a class in which Stern [19] would place those patients who have learned to produce the pseudovoice by using the air from the stomach bubble. Seeman did not admit of this type in his classification. Stern showed that in some of the cases no vicarious glottis exists, the patient merely bringing up air from the stomach bubble with the production of a sound like that of ordinary belching, the "ructus," and employing this basic sound at once for the formation of the pseudovoice. This is apparently the method used by some patients who have learned it without the aid of teaching; the voice may be satisfactory after practice for a long period.

One concluding point is the fact brought out by Stern that in some cases, as time goes on and the patient becomes more skilful, there occurs a "migration of the vicarious air chamber" from the position in which it develops at the beginning of the efforts to speak. There is usually a migration of the chamber upward into the esophagus from the stomach or into the upper esophagus from its lower and middle portions. This process enables the patient to produce the voice with less effort, and usually improves the quality of the pseudovoice as well.

THERAPY FOR THE PRODUCTION OF THE PSEUDOVOICE

The first point of importance in the consideration of the therapy is an answer to the question, how soon after laryngectomy should treatment begin? It seems agreed that it should begin as soon as the operative wound is soundly healed; this usually takes place within from four to six weeks of the surgical attack. As mentioned, Stern [19] advised that up to this time the patient should refrain from attempting to produce the pseudowhispered voice, as this usually proves a hindrance rather than a help in later therapy; he must make his wants known by the use of signs or with paper and pencil.

What is the plan of therapy to be followed? In this connection I follow the lead of Stern,[19] who admitted at the outset that he has no fixed plan of therapy, but allows himself to be guided largely by the patient, first helping him to produce some sound that seems easy for that patient, and then developing the therapy from this foundation stone.

At the first session, an explanation of the aims of the therapy should be made in the simplest possible terms, and it would seem advisable to outline, to the more intelligent patients at least, the essential facts of the anatomy of the mouth, pharynx, esophagus, chest and diaphragm, with something of the physiology of respiration and speech, so that they may better understand the mechanism whereby the pseudovoice may be produced. Then it is absolutely essential that the patient

be made to understand the difference between the respiration that he must carry for vital purposes and the mechanism of swallowing or aspirating air into the upper food passage and its expulsion for the production of the pseudovoice. As Stern so forcibly pointed out, not only is vital respiration no longer of any use for the purpose of phonation, but unless the patient learns to suspend his vital respiration during the production of the pseudovoice, it will prove an actual hindrance, because the noise of the rush of air through the tracheal cannula or tracheostoma will render the pseudovoice unintelligible; the combined efforts to breathe and speak at the same time soon exhaust the patient. This is one of the first lessons for the patient to learn; he must at once begin to dissociate the two processes, which his nervous centers and muscular apparatus have subconsciously joined intimately since birth. This is also the first, and often the greatest, difficulty that the patient encounters in the therapy.

He must therefore begin to practice the following exercises: (*a*) inspiration, suddenly checked and held, at which moment he swallows air; (*b*) inspiration, expiration, holding the breath and quickly swallowing air; the patient will be aided in his voluntary control of the thoracic respiratory movements if he places the hands with the palms and fingers laterally on the walls of the chest so that he palpates their movements, and is constantly reminded that he must not move the chest as he swallows and expels air; (*c*) completion of either of the foregoing exercises, the tracheal cannula then being stopped with the finger, and the swallowed air brought out as in belching, several times if possible, with the production of the loudest "ructus" possible.

The next step is practice in forming the explosive consonants p, t and k, using the eructed air. At first these will be scarcely audible; that they are being produced by blasts of air can be demonstrated to the patient by holding a strip of paper before the mouth during their production. Next, practice should begin with an attempt to form vowel sounds with the explosive consonants, forming such syllables as pa, pi, pe, po, pu; ta, ti, te, to, tu, etc., at first singly after each swallow of air, always attempting to make use of the air swallowed and then "belched" to produce the entire syllable, both vowel and consonant. When this has been accomplished, the formation of several of the syllables in one series after each swallow and eructation should be practiced.

Other preparatory exercises are soundless sucking, sipping and swallowing movements, and soundless movements of articulation of the lips, tongue and lower jaw. The production of the consonant k is of special value in bringing about the formation of the pseudoglottis. Another aid employed and highly recommended by Stern is the drinking of carbonated water or the plain effervescing powder of sodium

bicarbonate and tartaric acid; the patient eructs the gas liberated in the stomach, and endeavors with it to articulate one or more syllables, or even such short words as good. Stern has his patients assume a sort of erect position of readiness, like the military position of attention, with the articulatory mechanism in the position for the production of the desired syllable or word when the eructed gas reaches the pharynx and mouth.

Attention is called to the decided advantages of having the patient who is just beginning to learn pseudospeech in companionship with another who has become accomplished in its production. The psychic stimulus, the personal and practical instruction and the help of the repetition of desired actions are of enormous aid in shortening the duration of the therapy. Even unintelligent patients will mimic the actions of the companion, avoiding mistakes in method and often achieving good results with little additional aid from the physician.

While no definite order can be followed in every case, it is well to commence soon the practice of words, at first those of one syllable and beginning with the consonants g, d, k, p, b, t, etc., such as good, dust, kiss, put, etc., and then words of two or more syllables, such as coo-coo, etc. The practice of the long-sounding consonants w, s, etc., and of the fricative, toneless sounds f, sch and ss should also be carried on at this time. In the formation of words of more than one syllable the accent should fall on the last syllable, while those preceding it should be formed as quickly as possible. Such sounds as the double consonants are formed with difficulty because of the relatively large amounts of air required to produce them; it is best not to delay with the struggle, for even if the patient does not form such sounds clearly, his speech will not be much the worse for it.

When words of two and more syllables can be formed, and especially when they can be produced quickly after one another with the one aspiration of air, the patient should endeavor to form short sentences. Practice is here best carried on by easy reading exercises. Stern made the point that such reading should always "run along," by which he meant that the patient should not stop to struggle with a syllable or word that is difficult for him, but should go on easily, making but one effort to produce the troublesome sound; it may be easier for him the next time he reads the same exercise. This form of practice is of special benefit in helping the patient to learn the all-important dissociation of vital respiration and the aspiration and expulsion of air for phonation already stressed.

Practice in singing is also to be essayed. This is directed toward the education of the mechanism of the pseudovoice in the modulation of the sounds produced, in pitch. It is done by having the patient produce sounds while turning the head from side to side, or extend-

ing and flexing it on the neck, or bending it toward one or the other shoulder, etc., with the view of changing the tension of the parts forming the pseudoglottis, so that sounds of different pitches may be produced. Such modulation of the pitch of the pseudovoice is helpful in making it more like melodic normal speech. Stern stated that almost every patient can learn to produce tones of three different pitches; he also reported a remarkable case of a patient who learned to sing songs and whose pseudovoice had a clear range of two octaves from E to e and e_1, which is comparable with the range of many normal male singing voices.

Another method of practice that may aid in certain cases is the production of various syllables one after the other while rapidly nodding the head or allowing it to sink down on the chest while making gentle pressure with the fingers of both hands just below the angles of the lower jaw, or pressing backward at the level of the hyoid bone; sometimes the protrusion of the tongue will improve the pseudovoice. Gutzmann, junior,[17] advised especially practice with such sounds as k, in which there occurs a sharp friction sound deep within the pharynx; once this pharyngeal friction sound is well developed, efforts to produce it with other sounds and syllables may speedily lead to the production of the pseudovoice. To aid in the formation of the vicarious air chamber within the esophagus or stomach, Gutzmann made use of the following exercise: The patient pretends that he is drinking a large quantity of fluid—half a liter or more—from an empty glass of large size, all in one swallow; this maneuver brings into action, as Gutzmann put it, "the total of the muscular movements made use of by students in drinking beer by this method, which are excellently suited to the development of the vicarious air chamber."

These suggestions will perhaps serve to indicate the best methods of procedure in aiding patients to acquire a useful pseudovoice. Not all are necessary in every case; each patient must be treated individually, the leads that come in the course of the therapy being followed. As to the duration of the therapy necessary to achieve happy results, the time in which patients learn the rudiments of pseudovoice production varies greatly. Many factors are concerned, such as the anatomic and physiologic conditions obtaining after the operation, the strength of the patient, his intelligence, cleverness and ability, his patience and perseverance in practice and perhaps also the mode of therapy applied. Good results may be obtained in three or four weeks in some cases; other patients cannot be sent home to develop their pseudovoices further by continued practice and everyday use until several months have passed.

As to the amount of practice that should be done each day, Stern advised that at first not more than ten or twelve minutes of actual

practice should be done at each period, and that such periods be repeated not more than five or six times each day. He strongly advised that the patient be kept from too much practice at the beginning of the therapy. One can easily understand that a patient may do his utmost to acquire the first rudiments of the pseudovoice and later to increase his facility with it. He is overjoyed with his new voice after having been speechless; he is eager to be able to converse with his friends and to get back into some pursuit that will enable him to earn a living. He must be made to understand that he will do best if he makes haste slowly, until the necessary control is secured over both the pseudoglottis and the vicarious air chamber and he overcomes the difficulty of carrying on vital respiration and vocal aspiration and expulsion of air as two distinct functions.

Another reason for the strict limitation of practice in the early part of the therapy is the fact that some patients have definite difficulties as a result of the swallowing of air, and the consequent enlargement of the stomach air bubble. It is well known that in true aerophagy, because of the large amounts of air swallowed, there may be serious embarrassment of the cardiac or pulmonary action, or even such threatening conditions as acute dilatation of the stomach from atony. Stern stated that he had never observed such conditions during pseudovoice therapy; some of the patients, however, had difficulty in breathing or had attacks of tachycardia. These are to be avoided by short practice periods, not too often repeated. Stern [19] explained the rarity of disturbances due to the swallowing of air in the pseudovoice therapy by the facts (1) that the air thus swallowed is usually expelled at once during the ensuing phonation, so that large amounts of air do not collect in the stomach as in actual aerophagy, and (2) that in many cases "migration of the vicarious air chamber" takes place, and the stomach bubble is no longer employed in the production of the pseudovoice.

Stern brought up another point of practical importance: the occurrence of sudden "crises of regression" in the course of the therapy. The patient will suddenly fail to produce sounds previously learned, or will completely fail in the formation of the pseudovoice. Such crises are disturbing and disheartening for both patient and physician. They are due to psychic disturbances or to partial paresis of the muscular apparatus concerned from strain, especially if too much zeal is expended in practice; there may be a temporary atony of the stomach so that air cannot be expelled for phonatory purposes. Such crises usually pass in a few hours or days. The obvious treatment is complete cessation of all vocal efforts for a short time, with gradual resumption of the exercises, and encouragement of the patient. It is well to explain to the patient at the outset of the therapy that such crises may arise; they are

only temporary, and need not cause profound mental depression if the patient understands their nature beforehand.

As to prognosis, so many factors are concerned that the patient should not be promised too much at the beginning. Stern and other authors with considerable clinical experience agree that almost all laryngectomized patients can be taught a useful pseudovoice. Women seem to do somewhat better than men. In Stern's experience with about one hundred cases he met with two in which he failed to secure a good pseudovoice; in one, despite all efforts, the patient could not learn to eruct swallowed air; the other patient was a weak, old man; both had to be content with the pseudowhispered voice. Age itself does not seem to limit the patient, for Stern reported that men of 70 have learned to produce good pseudovoices; in general, however, increasing age is marked by a tendency to have less and less ability to learn any new thing, including the pseudovoice. Many of the patients treated will in time become exceedingly expert; a few persons will, almost without conscious effort, attain marvelous results with pseudovoices strikingly resembling the normal voice and capable of sufficient modulation to enable them to sing.

SUMMARY AND CONCLUSIONS

1. With the increasing number of persons rendered voiceless by total laryngectomy for laryngeal cancer, there is a growing need for a therapy of pseudovoice production without the larynx.

2. Patients with a complete, chronic, airtight stenosis of the larynx from any cause are similarly in need of a pseudovoice.

3. Laryngeal prostheses, or artificial larynges, have so many disadvantages that their use should be restricted to the patient who cannot learn to produce any type of pseudovoice.

4. There are several types of mechanism of the production of a pseudovoice. One is the true buccal or pseudowhispered voice. Almost every laryngectomized patient learns it without difficulty; it is so faulty and imperfect that it should be employed only when a more satisfactory type cannot be produced.

5. The pharyngeal pseudovoice is usually fairly satisfactory. It is produced with the aid of a pseudoglottis formed at the back of the mouth or in the hypopharynx, where air that has been aspirated or swallowed into a vicarious air chamber in the lowest hypopharynx or the esophagus and expelled again is set into audible vibrations; such sounds are modified into the vowels and consonants of the pseudovoice.

6. One of the most perfect forms of the pseudovoice is the esophageal type, in which the vicarious glottis lies at the esophageal mouth of Killian, and the vicarious air chamber is formed within the lumen of the esophagus, particularly in its cervical and upper thoracic portions.

Here the mechanism of pseudovoice production is strikingly like that of normal speech.

7. In some cases the cardiac end of the stomach, with the stomach air bubble, may be the vicarious air chamber, which furnishes a stream of air for a pseudoglottis at one of the sites mentioned.

8. A fairly definite system of therapy directed toward teaching the patient to produce one or another of the types of pseudovoice has been elaborated.

9. It seems essential that all surgeons who perform total laryngectomy or who have patients with complete, chronic laryngeal stenosis should be aware of the facts given, and should attempt to aid these voiceless persons in securing a useful pseudovoice; such patients will not be cut off in their social intercourse, nor will they be unable to earn a living because of their lack of intelligible speech.

10. Having in view the fact that almost all laryngectomized patients can learn a pseudovoice, the laryngeal surgeon should, if it is possible, so conduct the operation as to favor the production of the pseudovoice, at least, on anatomic and physiologic grounds.

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THE RÔLE OF CHRONIC AND OF SUBACUTE INFECTIONS IN DIABETIC CHILDREN *

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That acute infections produce an aggravation of symptoms in the usual diabetic child is a well known fact. With many others,[1] we have observed that low grade and early diabetic conditions are recognized first during acute colds and tonsillitis. The rôle of chronic and subacute infections in the diabetic child is not so well defined and requires more exacting studies.

During the past six years, approximately sixty diabetic children under the care of the pediatric department of the University Hospital were studied, and particular attention was paid to the rôle played by chronic and subacute infections. These children were observed at intervals varying from six weeks to six months, and more frequently when emergencies developed. As part of the routine physical examination, every patient was studied by the department of otolaryngology, and given treatment when necessary.

As acute infections so obviously decrease the tolerance for sugar in the diabetic child, and since malnutrition, anemia, lowered vitality and many other abnormal conditions are felt to be due to subacute and chronic infections of the upper respiratory tract in the nondiabetic child, a particularly careful otolaryngologic study of these diabetic children and the institution of indicated treatment were in order. Jeans and Boyd [2] noted the effect of chronic infections in diabetic children. The diabetic child represents better than the diabetic adult the true diabetic syndrome,[3] and the slightest fluctuation in his general condition is at once indicated in the sugar content of his blood and urine. Thus one has a good gage of the influence various factors have on the general condition of the child, factors that could not be determined so specifically

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* From the Department of Otolaryngology and Oral Surgery, State University of Iowa.

1. Priesel, R.: Ztschr. f. Kinderh. **39**:725, 1925.

2. Jeans, P. C., and Boyd, J. D.: Juvenile Diabetes and Chronic Upper Respiratory Infection, Am. J. Dis. Child. **32**:471 (Sept.) 1926.

3. Joslin, E. P.: End-Results in the Treatment of Diabetes Mellitus in Children, J. A. M. A. **88**:28 (Jan. 1) 1927.

in the nondiabetic patient. It is felt that this study may also cast more light on the rôle of low grade infections in the nondiabetic child.

On the child's admission to the hospital, a careful history of the frequency of cold in the head, sore throat and acute conditions of the ear was obtained. Also, an inquiry was made as to whether the patient had had scarlet fever, diphtheria, quinsy or influenza. An otolaryngologic examination followed. At this time, much useful information was acquired with the nasopharyngoscope, and if indicated, the aspiration of each maxillary sinus. In younger children it was necessary to use a general anesthetic during both of these procedures. Transillumination was of little value in the examination of children under 6 years of age. Roentgenograms of the maxillary sinuses were of definite value but not infallible. Because of the soft bone in younger children, a shadow occasionally was cast which gave the appearance of blurring when the sinuses were normal. On the other hand, not infrequently gross pus was aspirated when roentgenograms of the antrums showed them apparently to be quite clear.

When the child was established on a diabetic regimen, and was apparently on a stable basis regarding diet and the dosage of insulin, operative procedures were performed when indicated. If there was a history of frequent sore throat and the tonsils appeared to be chronically infected, they were removed. When the previous physical examination, including roentgen findings, showed evidence of infection in the maxillary sinuses, they were aspirated at the time of tonsillectomy. Large antrameatal openings were made in the inferior meati when macroscopic pus was obtained. The sinuses were washed out every four days thereafter until the washings were returned clear.

In the majority of cases, only the faucial and pharyngeal tonsils were removed. Sinusitis was prevalent, and, as will be noted in later statistics, the ethmoids were chiefly involved. In almost every instance, ethmoiditis was treated conservatively, packs of ephedrine and of mild silver protein being used with satisfactory results. Ephedrine sulphate in 3 per cent solution has been used, and careful observation revealed no demonstrable effect on the carbohydrate metabolism resulting from the use of this drug in moderate dosages.

Four hundred and seven observations were made on the sixty-three patients studied. The following diagnoses were made:

Chronic suppurative paranasal sinusitis	171
Chronic faucial and pharyngeal tonsillitis	55
Acute otitis media	10
Acute mastoiditis	6
Chronic lingual tonsillitis	2
Suppurative cervical adenitis	1

The following operative procedures were performed:

Faucial and pharyngeal tonsillectomies	50
Antrameatal windows	16
Mastoidectomies	5
Caldwell-Luc	1
Lingual cautery	1

When careful preoperative and postoperative measures were employed these patients responded as well in regard to convalescence as did normal children. Particular attention was paid to the diet of the child on the day of operation. The following dietary regimen was usually carried out by the department of pediatrics at the Children's Hospital. The patient received his usual dosage of insulin at the customary times, but only two meals were given. The potential dextrose content of breakfast was given in the form of milk, orangeade and stick candy. These were offered in two or three servings, the last of which was taken at least three hours before operation. Following operation no food was offered until nausea had ceased, which was usually from three to four hours later. The second meal, in the form of milk, orangeade and ice cream of known composition, was given in quantities equivalent to the dextrose content of the usual noon meal. This postoperative nourishment was given slowly, in small amounts, over a considerable period. On the following day the usual three meals were resumed, modified so as to be bland and nonirritating.

To keep the sugar in the urine and blood within reasonable limits, a careful check was made during the first days following operation, and the dosage of insulin was increased when indicated. Ethylene anesthesia was used frequently with no untoward results. Although there was slightly more bleeding at operation, fewer postoperative hemorrhages were noted in these cases than in nondiabetic children. Healing took place as rapidly as in nondiabetic children, and no postoperative complications have been seen in this series.

The effect on the diabetic condition of the elimination of infections was as follows: The tolerance for carbohydrates was used as an indication of the severity of the diabetes. This tolerance represented the amount of food in grams of potential carbohydrate that the patient utilized by his own metabolic processes without spilling sugar in the urine. That portion of the food taken care of by the dosage of insulin was, of course, excluded. The tolerance for carbohydrates before and after operations gave us some idea as to the possible bearing of the infection on the course of the disease (see charts).

Having procured a constant factor in regard to diet and insulin, we selected children who could be observed over the greatest period and in

whose cases poor care at home, low mentality, noncooperation and other variable factors did not appear.

These children were divided into two main groups: (1) those who had a small amount of chronic infection in the upper respiratory tract and who were treated conservatively and (2) those in whom a marked amount of infection persisted and who required more radical measures.

By far the largest proportion of cases fell in the first group. Removal of tonsils and conservative treatment of the nose with ephedrine packs were the usual measures when maxillary sinusitis was not present. The results of these measures on the tolerance for carbohydrates is noted in the summary of all cases observed.

SUMMARY OF CASES

CASE 1 (V. F.).—The usual change in the tolerance for carbohydrates when careful check is made on the infection and treatment promptly instituted is shown in chart 1.

CASE 2 (D. H.).—Because of parental objection, the tonsils and adenoids were not removed for three years after the patient's first admission. It was interesting to note that during this period the child had arthritis, tonsillitis, otitis media, pneumonia and frequent colds in the head. The tolerance for carbohydrates did not increase markedly until after the maxillary sinuses were adequately drained. On the last admission, following this treatment, as is shown in the last column on chart 2, tolerance had increased to its highest point in four years.

CASE 3 (D. N.).—This child was sent to the University Hospital with a diagnosis of diabetes and a tentative diagnosis of pulmonary tuberculosis because of constant low grade fever. Physical examination revealed that she had chronic suppurative paranasal sinusitis and chronically infected faucial and pharyngeal tonsils. Pulmonary examination gave negative results. The sinusitis was treated conservatively, and on the third admission, tonsillectomy was done. However, the temperature did not subside following this procedure. Although the maxillary sinuses apparently had been normal on the previous admission, on the last admission exploratory puncture of the maxillary antrum was done, and much pus was recovered from the washing. Antrameatal openings were made, and the sinuses were washed at intervals of four days for six periods. At the end of that time the temperature became normal, and the tolerance for carbohydrates showed an increase of one-third in the amount of food that could be taken without insulin (chart 3).

CASE 4 (V. H).—The case of this patient, aged 15, was particularly interesting because of the special tendency toward repeated infection of the upper respiratory tract. After a reasonable period following the removal of the tonsils and adenoids, there was a moderate gain of tolerance until November, 1917, when she entered the hospital with acute mastoiditis; she improved gradually under conservative treatment. On the next to the last admission, the patient had acute mastoiditis and acute infection of the paranasal sinuses, from which she again slowly recovered. Later, roentgenograms showed rather marked blurring of the right maxillary sinus and injection of iodized poppy-seed oil 40 per cent revealed a markedly thickened membrane and a large cyst or polyp. A Caldwell-Luc operation on the

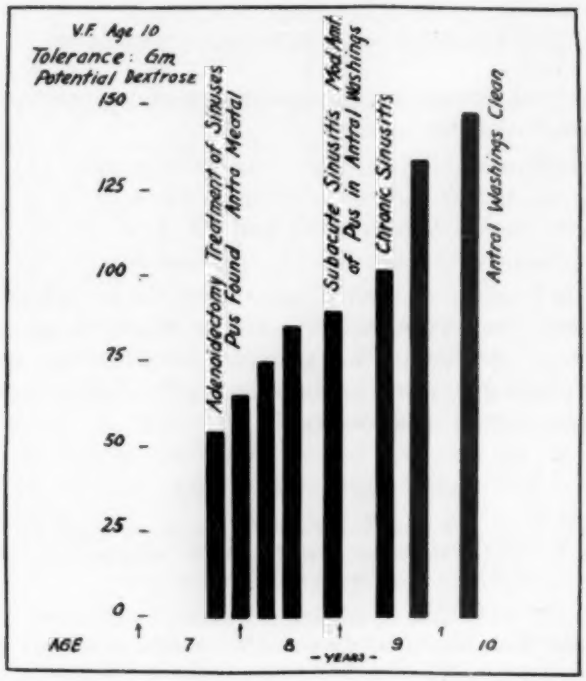

Chart 1.—There was an increase in the tolerance for carbohydrates of 150 Gm. over a period of three years. An infection of the upper respiratory tract was treated. The last examination revealed little infection in the throat or sinuses.

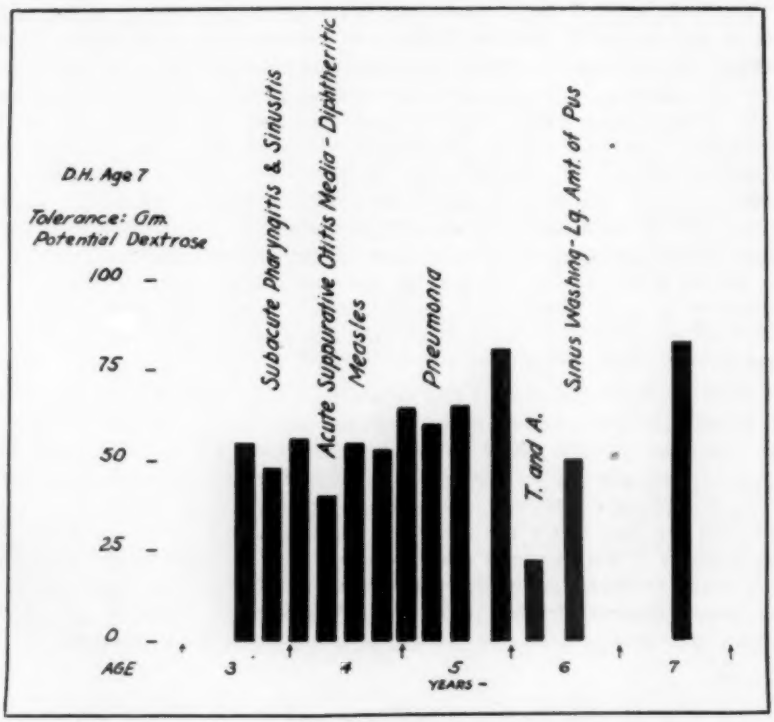

Chart 2.—Following removal of the tonsils and adequate drainage of the sinuses there was a marked increase in the tolerance for carbohydrates.

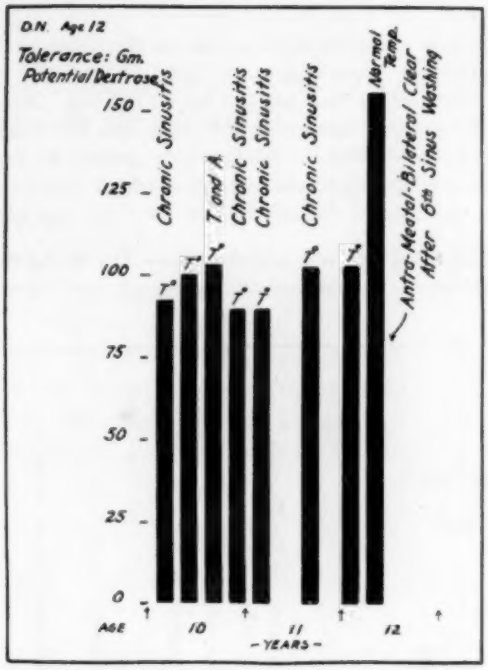

Chart 3.—Low grade fever and tolerance for carbohydrates did not improve until bilateral antrameatal openings were made.

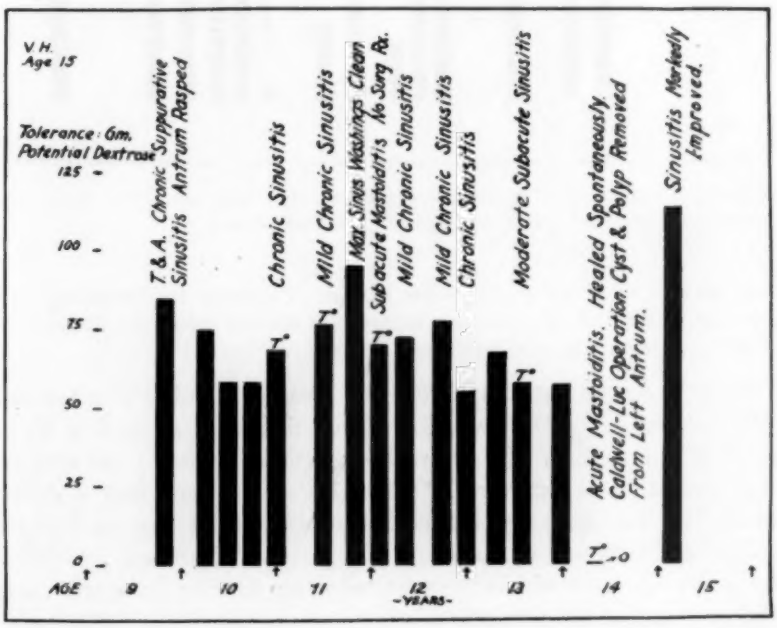

Chart 4.—After radical removal of the polyps and cyst from the right maxillary sinus there was definite improvement in the unusual amount of infection.

right side was thought necessary because of the chronicity of the infection and the extensive pathologic process present, and also because the patient was physically much more mature than her age would indicate. At operation, a large cyst and a thickened polypoid membrane were removed, and much pus was found. On the admission following this radical operative procedure, the patient was free from fever and had gained considerable weight, and her tolerance for carbohydrates had increased to a higher point than at any time since her first admission (chart 4).

CASE 5 (W. C).—This case was slightly different from the others, since on all admissions subsequent to the removal of the tonsils and adenoids in 1925 the

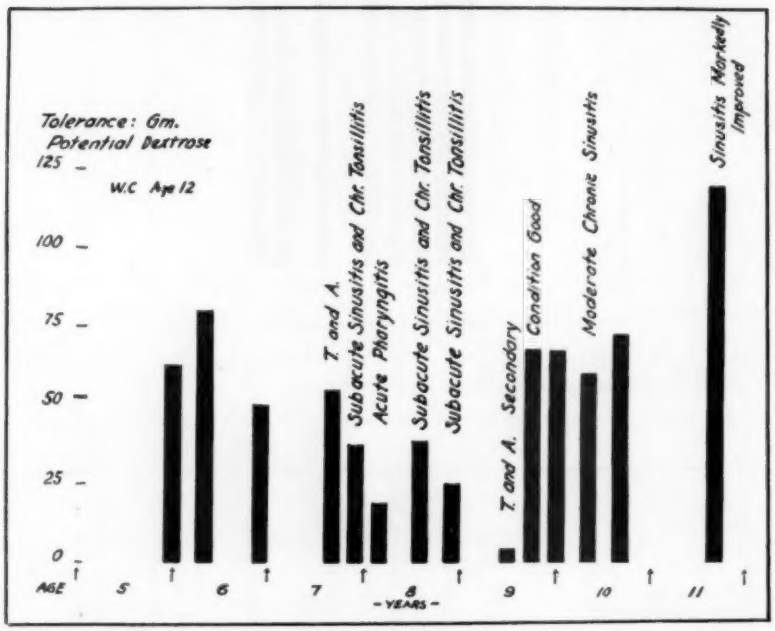

Chart 5.—Improvement in tolerance for food was seen only after the removal of chronically infected lymphoid tissue in tonsillar fossae.

patient showed large, infected tonsillar stumps. Following the secondary tonsillectomy, at which time a considerable regrowth of adenoid tissue also was removed, marked increase in tolerance was noted (chart 5).

In the group of patients studied, the average number of admissions to the hospital per patient was 8.7. Sinusitis was diagnosed on 41 per cent of all admissions. Of the patients with sinusitis, 51 per cent had rectal temperatures between 100 and 101 F. There was a definite decrease in the tolerance for carbohydrates in 73 per cent of the children when chronic or subacute sinusitis was diagnosed. A definite increase in tolerance within the year following tonsillectomy was shown in 70 per cent of the patients.

CONCLUSIONS

1. Chronic and subacute infections of the upper respiratory tract are common among diabetic children.

2. Operative procedure on the diabetic patient is no more hazardous than on the nondiabetic patient, if proper preoperative and postoperative treatment is observed.

3. In the cases studied, frequent improvement in the general health as well as in the tolerance for carbohydrates was seen following treatment for chronic infection.

4. Chronic and subacute infections are much more frequently diagnosed in children when a thorough and complete otolaryngologic study is made. A child with diabetes should receive the same careful study for foci that would be given an arthritic or nephritic patient.

THE RELATION OF CLINICAL TO BACTERIOLOGIC OBSERVATIONS IN NORMAL AND IN DISEASED MAXILLARY ANTRUMS *

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INTRODUCTION

There is a noticeable paucity of literature relative to the bacteriologic content of the maxillary sinus. With but few exceptions the literature teaches that the normal maxillary sinus or antrum of Highmore is sterile or free from bacteria. Törne,[1] in 1903, demonstrated that healthy accessory sinuses of persons who had not been dead over two hours were sterile. Lewis and Turner,[2] in 1905, concluded after much investigation that the healthy accessory sinuses were probably sterile. Skillern,[3] in 1912, examined post mortem the antrums of one hundred persons who died of tuberculosis, and he came to the conclusion that in health the sinuses were free from bacteria. From these investigations it would appear that the normal antrum may be regarded as sterile or free from virulent pathogenic bacteria. It should be noted that an antrum may show changes produced by some preceding infection and at a subsequent time be sterile.

PURPOSE

I have attempted to correlate the bacteriologic with the clinical observations in maxillary sinusitis, and to ascertain whether or not normal antrums are free from bacteria and to make certain correct observations as to the bacteriologic flora of the antrums in normal and diseased conditions. Moreover, I was especially desirous to determine whether or not anaerobic bacteria are found in normal or diseased antrums and the part they play with saprophytic bacteria when the natural and accessory maxillary openings have become occluded with the attendant

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1. Törne, F.: Zentralbl. f. Bakt. **33**:250, 1903.

2. Lewis, C. J., and Turner, A. L.: Edinburgh M. J. **18**:393, 1905.

3. Skillern, R. H.: The Exploratory Needle Puncture of the Maxillary Antrum in One Hundred Tuberculous Individuals, J. A. M. A. **59**:1136 (Sept. 21) 1912.

absorption of residual air and the resultant negative pressure within the sinus. Following such a pressure there would be an exudate of mucus from the membrane, and if the process were allowed to continue, a transudation of serum from the blood vessels, capillaries and lymph spaces would ensue with a resultant potential culture medium favorable for infection. Further, the physical character of the secretions obtained from the sinuses on diagnostic puncture and washings has been very loosely interpreted. Many outstanding sinuologists and others have heretofore considered the maxillary sinus washings negative when the washings were returned clear and transparent. In fact, they are universally interpreted as such. This investigation proves the fallacy of such an interpretation. Any procedure could be considered valuable that would aid in making a more accurate diagnosis and exacting treatment of sinus disease. That the ideal goal has not been reached is obvious when one observes the amount of dissatisfaction between the sinuologist and the patient in the relief of sinus disease.

In 1886, Weichselbaum [4] reported that he had found the pneumococcus, Friedländer's bacillus, *Streptococcus pyogenes* and *Staphylococcus pyogenes aureus* and *albus* in sections from the nose and accessory sinuses as well as the lungs.

In 1889, von Besser [5] described the pneumococcus in antral empyema, and Luc [6] reported similar observations.

In 1892, Weichselbaum reported inflammatory changes in four of six patients who died of influenza; the organisms found being the pneumococcus, small cocci and some bacilli, probably *Bacillus influenzae*. Also, in a later article in the same year, two more cases of infected antrums were reported by this same author.

In 1894, Lichtwitz [7] in one of his articles made mention of the observations of Sabrazes which consisted, in cases of inflamed antrums, of *Streptococcus pyogenes* alone, or in association with *Staphylococcus albus* or *aureus*, and *Staphylococcus albus* and *citreus*.

In 1895, Herzfeld and Hermann [8] reported on ten cases and found the streptococcus, staphylococcus, organisms resembling Friedländer's bacillus, *Bacillus proteus* and a coliform bacillus.

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4. Weichselbaum, A., quoted by Kuhnt; cited by Howard and Ingersoll (footnote 13).

5. von Besser, L.: Beitr. z. path. Anat. u. z. allg. Path. **6**:331, 1889.

6. Luc, Henry: Arch. internat. de laryng., July-August, 1894, vol. 4; quoted by Howard and Ingersoll (footnote 13).

7. Lichtwitz, L.: Prag. med. Wchnschr., 1894, no. 31; quoted by Howard and Ingersoll (footnote 13).

8. Herzfeld and Hermann: Arch. f. Laryng. u. Rhin. **3**:143, 1895; quoted by Lewis and Turner (footnote 2).

In the same year Dmochowski [9] examined the contents of twenty-one antrums, eighteen of which were inflammatory. The organisms found were *Bacillus pyogenes foetidus, Streptococcus pyogenes, Staphylococcus pyogenes aureus,* Friedländer's pneumobacillus and some unidentified bacilli.

Wolff,[10] at about the same time, reported the observations on the accessory sinuses in fatal cases of diphtheria, scarlatina and measles. In twenty-two cases of diphtheria the antrums were always involved. *Bacillus diphtheriae* was present in twelve cases; the other organisms found were the pneumococcus, *Streptococcus pyogenes, Staphylococcus pyogenes aureus, Staphylococcus pyogenes flavus* and *Bacillus pyocyaneus.* In cases of measles, the pneumococcus, streptococcus and staphylococcus were present, and in cases of scarlatina, streptococci, *Staphylococcus pyogenes aureus* and *B. pyocyaneus* were cultured.

In 1896, Wagner [11] reported two cases of antral empyema with lead poisoning.

In the same year, Fränkel [12] found the pneumococcus to be the predominating organism in pus from the sinuses in fatal influenza cases, and also demonstrated the evidence of nontuberculous sinus infection in every third phthisical corpse.

In 1896, Howard and Ingersoll [13] published their article, "A Contribution to Our Knowledge of the Etiology of Inflammation of the Accessory Sinuses of the Nose." They used exploratory puncture, with a trocar, under the middle third of the inferior turbinate, in obtaining most of their specimens from the maxillary antrums. The following organisms were encountered: *Streptococcus pyogenes,* influenza bacillus, *Staphylococcus pyogenes aureus,* the pneumococcus and diphtheroid. They concluded that acute and chronic inflammations of the accessory sinuses of the nose are not caused by a single micro-organism or by a single group of organisms, but are due to bacteria in general.

In 1899, Pearce [14] reported his results in diphtheria and scarlet fever in fifty cases. Examinations were conducted post mortem, and especial interest in the antrums rather than the other sinuses was taken. Thirty-nine cases of diphtheria were examined; *B. diphtheriae* was present in thirty-two cases. The streptococcus, pneumococcus, *Staphylococcus*

9. Dmochowski, Z.: Arch. f. Laryng. u. Rhin. **3**:255, 1895; quoted by Lewis and Turner (footnote 2).

10. Wolff, M.: Ztschr. f. Hyg. u. Infectionskrankh., 1895, vol. 19; quoted by Howard and Ingersoll (footnote 13).

11. Wagner, H. L.: New York M. J., August, 1896.

12. Fränkel, E.: Virchows Arch. f. path. Anat. **143**:42, 1896; quoted by Skillern (footnote 3).

13. Howard, W. T., and Ingersoll, J. M.: Am. J. M. Sc. **115**:520, 1898.

14. Pearce, R. M.: J. Boston Soc. M. Sc. **3**:215, 1899.

pyogenes albus and *aureus* and *Bacillus coli* were also found. In two cases of diphtheria with measles, the diphtheria bacillus and streptococcus were found in both. In five cases of diphtheria with scarlet fever, two cases showed *B. diphtheriae,* the streptococcus, *Staphylococcus pyogenes aureus* and a variety of unrecognized bacteria. In four cases of scarlet fever, the streptococcus, *Staphylococcus aureus* and *albus, B. pyogenes aureus* and a short diplobacillus were found.

In 1900, Stanculeanu and Baup [15] suggested that empyema in the sinuses either was due to several dental microbes (chiefly anaerobic) or was of nasal origin and due to such organisms as the pneumococcus and *Streptococcus pyogenes.*

In 1901, Wertheim [16] duplicated Fränkel's results as to sinus infection in phthisical patients at autopsy.

In 1902, Stacy [17] published his results on the bacteriology of the sinuses. He obtained the material post mortem and stated that his results were far from being exact on account of the cultures being partly overgrown by saprophytic bacteria and by bacteria which grew more luxuriantly than the more pathogenic ones. Among the bacteria found were the staphylococcus, streptococcus, B. tuberculosis and other bacilli.

In 1905, Lewis and Turner [2] published their work on suppuration of the accessory sinuses of the nose, in which they stated that their conclusion was that healthy accessory sinuses were probably sterile and that there were three main organisms commonly met with in suppuration of the accessory sinuses, namely, the streptococcus, pneumococcus and staphylococcus. The authors used sterile swabs in obtaining specimens from the affected sinuses. No special technic was indicated.

In 1908, Darling [18] reported on pneumococcus infections coming to autopsy. They showed to a very marked degree a more or less typical pneumococcus inflammation of one or more of the accessory sinuses. Pneumococci were always present, their number depending on the duration of the process.

In 1909, Faunce [19] gave an account of the bacterial analysis of forty specimens of pus aspirated from the maxillary sinus. Bacteria found were *Staphylococcus aureus, albus* and *citreus,* the streptococcus, pneumococcus, pneumobacillus, *Bacillus mucosus capsulatus, B. diphtheriae, Bacillus xerosis* and *Bacillus aerogenes capsulatus.*

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15. Stanculeanu, G., and Baup: Arch. de sc. méd. de Bucarest. **5**:121, 1900; quoted by Lewis and Turner (footnote 2).

16. Wertheim, N.: Arch. f. Laryng. u. Rhin. **11**:169, 1901; quoted by Skillern (footnote 3).

17. Stacy, H. S.: The Bacteriology of the Sinuses, J. Laryng. & Otol. **17**:566, 1902.

18. Darling, S. T.: The Accessory Nasal Sinuses and Pneumococcus Infections, J. A. M. A. **47**:1561 (Nov. 10) 1906.

19. Faunce, C. B.: Boston M. & S. J. **160**:652, 1909.

Hajek's [20] list of bacteria causing disease of the accessory sinuses, in 1909, included the influenza bacillus, pneumococcus, *Staphylococcus pyogenes aureus* and *albus, Streptococcus pyogenes, Bacterium coli,* the pseudodiphtheria bacillus, *B. pyocyaneus,* Friedländer's bacillus and *Meningococcus intracellularis,* while Zarniko [21] in the following year published his observations, which included the pneumococcus, staphylococcus, streptococcus, influenza bacillus, pseudodiphtheria bacillus, Friedländer's capsule bacillus, *Meningococcus intracellularis, B. coli, B. pyocyaneus* and *B. pyogenes foetidus.*

In 1910, Lewis and Turner [22] reported their further study of the bacteriology of suppuration in the accessory sinuses. They examined forty-three antrums in which suppuration was present. Specimens were taken either directly from the cavity or from the washings of the antrum. The cultures were grown aerobically and anaerobically. The authors came to the conclusion that sinus suppuration is not caused by any one particular organism, that four main types of coccus are commonly met with in sinus suppuration; namely, pneumococci, streptococci, staphylococci and diplococci of the type of *Micrococcus catarrhalis,* and *B. coli,* putrefactive bacteria, dental organisms, diphtheroids, *B. influenzae* and obligate anaerobes are often present.

In 1911, Lewis [23] presented the results of further study. Specimens examined consisted of swabs from pus or washings. Organisms found were *Staphylococcus pyogenes aureus, citreus* and *albus,* streptococci, pneumococci, *Micrococcus catarrhalis,* coliform bacilli, diphtheroids, the mesenteric group, dental organisms, obligate anaerobes and miscellaneous bacteria.

Skillern,[3] in 1912, examined post mortem the maxillary antrums of one hundred persons dead of tuberculosis. He came to the conclusion that in health the sinuses were free from bacteria and that tuberculosis was not a predisposing factor in sinus infections. Skillern's work appeared to be in agreement with the observations of Törne,[1] in 1903, who demonstrated that healthy sinuses of persons who had not been dead over two hours were sterile.

Kyle,[24] in 1916, published his report on sinus infection, and his conclusion was that true pathogenic bacteria were numerous in acute and subacute suppuration, whereas the nonpathogenic or mildly pathogenic

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20. Hajek, M.: Ztschr. f. Ohrenh. **56**:189, 1909; quoted by Skillern (footnote 3).

21. Zarniko, C.: Deutsche med. Wchnschr., 1891, no. 44, p. 1222.

22. Lewis, C. J., and Turner, A. L.: A Further Study of the Bacteriology of the Suppuration in the Accessory Sinuses of the Nose, Edinburgh M. J. **4**:293, 1910.

23. Lewis, C. J.: J. Path. & Bact. **16**:29, 1911.

24. Kyle, J.: California State J. Med. **14**:238, 1916.

organisms were found in chronic conditions. The organisms that he encountered were *Staphylococcus albus citreus, B. pyocyaneus,* the pneumococcus, streptococcus, *Micrococcus tetragenus* and *Micrococcus catarrhalis.*

Babcock,[25] in 1918, reported the following observations, making a distinction between acute and chronic conditions of the sinuses. He admitted the possibility of specimens having been contaminated in passage through the nose. Acute cases were represented by the pneumococcus, streptococcus, *Staphylococcus aureus* and *albus, B. influenzae, Micrococcus catarrhalis,* diphtheroid bacillus, *B. coli communis, B. foecalis alkaligenes, B. aureus, B. proteus* and *B. subtilis.* Chronic cases included the pneumococcus, streptococcus, *Staphylococcus aureus* and *albus, B. influenzae, B. mucosus capsulatus,* diphtheroid bacillus, *B. coli communis, B. foecalis alkaligenes, B. aureus, B. proteus, Micrococcus tetragenus* and *B. subtilis.* The only difference between acute and chronic cases was in the fact that in acute cases the pneumococcus was the predominating organism, while in chronic cases the streptococcus was found in large numbers; a very slight increase in the number of staphylococci was noticed in chronic cases.

In the same year Coakley [26] presented his observations on pneumococcus infection of the nasal accessory sinuses. He also made a distinction between acute and chronic cases. One hundred and nine acute cases were studied and forty-eight showed the presence of the pneumococcus. Of seventy-nine chronic cases pneumococci were present in ten.

Crowe and Thacker [27] studied the influenza bacillus in sinus infections. Puncture with the trocar under the anterior end of the inferior turbinate was used to obtain specimens. Washings were collected with sterile precautions and cultured. Two series of patients were observed. The first series, consisting of seventy cases, were examined during a period when there was no influenza epidemic, and fifteen cases showed presence of *B. influenzae;* other bacteria encountered were the streptococcus, hemolytic and nonhemolytic pneumococcus, staphylococcus, *B. proteus* and *B. diphtheriae.* Of thirty cases of the second series examined during an influenza epidemic, eight showed *B. influenzae;* the pneumococcus, streptococcus, hemolytic and nonhemolytic, hemolytic staphylococcus, *Micrococcus catarrhalis, Proteus vulgaris,* gram-diphtheroid, *B. diphtheriae* and *B. lactis aerogenes* being the other organisms found in this series. The authors came to the conclusion that *B. influenzae* was a secondary invader in sinus infections.

25. Babcock, J. W.: Laryngoscope **28**:527, 1918.

26. Coakley, C. C.: Tr. Am. Laryng. A., 1918, p. 307.

27. Crowe, S. J., and Thacker, N. W. S.: China M. J. **34**:264, 1920.

Dean and Armstrong,[28] in 1919, made a study of sinus disease in infants and young children, including a bacteriologic study. Dean,[29] in 1921, found in ninety-eight cases, the staphylococcus present in forty-five, the pneumococcus in thirteen, unidentified gram-negative bacilli in eight, diphtheroid bacilli in seven, *Micrococcus catarrhalis* in seven, the hemolytic streptococcus in five, *Staphylococcus viridans* in one and Friedländer's bacilli in two.

Cary and McGinnis[30] studied, in 1923, the contents of infected sinuses and found hemolytic and nonhemolytic *Staphylococcus aureus, Staphylococcus albus, Streptococcus viridans, Micrococcus tetragenus, B. coli,* anaerobic bacilli and unidentified bacilli.

One hundred cases of nasal sinusitis were studied by Carmack[31] for a period of four years and reported in 1928. He concluded that three organisms, which were the staphylococcus, pneumococcus and streptococcus, occurred with reasonable constancy in sinus infections. He found staphylococci in practically all cultures from chronic cases. This author stated that an effort was made to avoid contamination, but he made no mention of a preliminary control culture of the nose being made or a technic for the sterilization of the area at the site of antral puncture.

In 1928, Wirth[32] published his bacteriologic research on the nasal accessory sinuses. His article was more important, however, from a clinical point of view. He did not mention any distinction to have been made between different sinuses. He reported a chronic case of sinus infection with the hemolytic streptococcus, and another one due to mixed infection with the pneumococcus and *B. influenzae.*

In 1929, a report by Watson and Williams[33] as to the variations in the incidence of pneumococcal infection in the accessory sinuses of children appeared, stating that there was a closed association between the incidence of pneumococcal infection in the accessory sinuses and that of pneumonia, the rise and fall of sinus pneumococcal infection tending to precede that of pneumonia.

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28. Dean, L. W., and Armstrong, L. N.: Sinus Disease in Infants and Young Children, Including a Bacteriological Study, Ann. Otol., Rhin. & Laryng. **28**:452, 1919.

29. Dean, L. W.: Paranasal Sinus Disease in Children, Univ. Iowa Stud. Med., April 15, 1921, vol. 2, no. 1.

30. Cary, W. E., and McGinnis, E.: Laryngoscope **33**:424, 1923.

31. Carmack, J. W.: One Hundred Cases of Nasal Sinusitis With Bacteriological Reports, Eye, Ear, Nose & Throat Monthly **6**:671 (Jan.) 1928.

32. Wirth, E.: Bacteriological Findings in Nasal Sinuses, Ztschr. f. Laryng., Rhin. **16**:453, 1928.

33. Watson and Williams, E.: Brit. M. J. **1**:720, 1929.

In the same year Carmody and Greene,[34] who studied the relation of sinus disease to hay fever, concluded that unless there was an infection in the sinuses, irritants, such as dusts, pollens, bacteria, foods and emanations of all sorts, did not produce allergic hay fever.

Skillern,[35] in his book, "Accessory Sinuses of the Nose," reported his few bacteriologic observations on the antral contents, which consisted of *Staphylococcus pyogenes aureus, B. cereus, Bacterium striatum* and an unidentified bacillus. His technic for obtaining these specimens was not clear as to the avoidance of contamination.

Cases of aspergillosis of the nasal sinuses have been reported at different times by different workers. Tilley[36] reported such a case in 1915. McKenzie[37] reported a case of antral empyema due to *Aspergillus fumigatus* as early as 1891. Zarniko[21] reported a similar case at the same time. Harmer and Jockes[38] exhibited specimens of *Aspergillus fumigatus* from nasal sinuses at the Royal Society of Medicine in London, in 1918.

Since sinuses are in such close association with the nose, it seems useful to mention certain investigations of the bacteriology of the nasal cavities. In 1889, Wright[39] reported his bacterial observations in healthy noses, which included *Staphylococcus pyogenes aureus, albus* and *citreus, Micrococcus flavus desidens, B. lactis aerogenes, Penicillium glaucum, Micrococcus cereus flavus, Micrococcus tetragenus* and some undescribed forms.

In 1898, Park and Wright,[40] on the basis of their experimental work, concluded that organisms were normally in the healthy nose, but in rather scant quantities. Their work was preceded by that of Thompson and Hewlett,[41] in 1895, in which it was stated that the mucous membrane of the healthy nose only exceptionally showed any micro-organisms whatsoever. The interior of the great majority of normal nasal cavities was perfectly sterile. Their work was in agreement with the experiments by Wurtz and Lermoyez,[42] in 1893. These investigators believed that human nasal mucus possessed bactericidal power, and, therefore,

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34. Carmody, T. E., and Greene, L. W.: Relation of Sinus Disease to Hay Fever, Ann. Otol., Rhin. & Laryng. **38**:759, 1929.

35. Skillern, R. H.: Accessory Sinuses of the Nose, ed. 4, Philadelphia, J. B. Lippincott Company, 1923.

36. Tilley, H.: J. Laryng. & Otol. **30**:145, 1915.

37. McKenzie, J. N.: Bull. Johns Hopkins Hosp., 1891.

38. Harmer, D., and Jockes, T.: Proc. Roy. Soc. Med. **12**:187, 1918-1919.

39. Wright, J.: New York M. J. **50**:92, 1889.

40. Park, W. H., and Wright, J.: J. Laryng. & Otol. **13**:124, 1898.

41. Thompson, St. Clair; and Hewlett, R. T.: Tr. Med.-Chir. Soc. Edinburgh **88**:239, 1895.

42. Wurtz, R., and Lermoyez, M.: Ann. d. mal. de l'oreille, du larynx, 1893, vol. 19.

nasal cavities were relatively sterile. The same view was expressed by Piaget,[43] in 1897, on the basis of his experimental work. Researches by Thompson and Hewlett were followed, in 1896, by Klemperer,[44] who concluded from his experiments that no part of the nose was germ-free at any time. However, a recent work by Arnold, Ostrom and Singer (1928)[45] maintained that from 90 to 95 per cent of viable bacteria placed on the mucous membrane of the nose were rendered nonviable within five to ten minutes.

Törne [1] also demonstrated that if the maxillary secretion did not possess strong bactericidal properties, it was decidedly inhibitory to bacterial growth.

Sir St. Clair Thompson [46] in his text said that an enumeration of the result of various bacterioscopic examinations does not materially advance the subject, and cited Fränkel.

Oaks and Merrill [47] maintained that cultures of washings are mainly an academic procedure and are not dependable.

CLINICAL CLASSIFICATION

All of the cases represented in the accompanying tables were clinical cases from the Department of Otolaryngology at the Northwestern University Medical School. The diagnoses were made by the clinicians in the department. In many cases a positive diagnosis could not be made owing to the fact that these cases were not contaminated by puncture and washing prior to the investigation done by me. I have grouped the cases into two large groups, namely, cases reported clinically normal and cases reported clinically diseased, as pertaining to the antrum.

PROCEDURE EMPLOYED IN OBTAINING CULTURES

Several attempts were made to obtain negative cultures of the nose and inferior turbinate region at the site of puncture of the naso-antral wall. Occasionally we were able to obtain a negative preliminary culture and not until the preliminary culture was negative and showed no evidence of contamination did we use the antral washings.

Numerous investigators have endeavored to study the bacteriologic control, but have been loath to describe their method of obtaining cultures, some merely stating that an attempt was made to avoid con-

43. Piaget, R.: Ann. d. mal. de l'oreille, du larynx **23**:117, 1897.

44. Klemperer, S.: J. Laryng. & Otol. **2**:286 (Nov.) 1896.

45. Arnold, L.; Ostrom, M. L., and Singer, C.: Autosterilizing Power of the Nasal Mucous Membrane, Proc. Soc. Exper. Biol. & Med. **25**:624 (May) 1928.

46. Thompson, St. Clair: Diseases of the Nose and Throat, ed. 3, New York, D. Appleton & Company, 1926.

47. Oaks, L. W., and Merrill, H. G.: What Constitutes an Examination for Sinuses? Eye, Ear, Nose & Throat Monthly **9**:207, 1930.

tamination. Many have caught the secretions in sterile containers on leaving the nose, which obviously makes the observations unreliable and permits every possible sort of contamination.

Bloomfield,[48] in 1923, reported on the use of antiseptics on bacterial flora of the upper air passages and the difficulties in obtaining negative cultures.

Dean [49] used a 70 per cent alcohol swab before passing the trocar into the sinus for cultures. However, it is known that alcohol is very uncertain as to its germicidal activity, time, etc., depending on circumstances. Dean also painted the middle meatus with methylene blue (methylthionine chloride U. S. P.), with the idea of ascertaining whether or not the salt solution might flow out through the ostium with positive pressure and be drawn back again with negative pressure, thereby contaminating the washes. I used fluorescein and agree with Dean in that there was not the slightest tinge of staining in the washings. Dean stated that should contamination take place, the bacteria would be those normally found in the nose.

The reports of writers in my review of the literature are to be questioned owing to the fact that no preliminary negative cultures were obtained. Many writers simply make the statement that a culture was taken avoiding contamination, which means they did not endeavor to establish a technic preventing contamination or appreciate the necessity of obtaining a negative preliminary culture.

The technic which represents our final efforts and the one which gave only a very small percentage of positive control cultures is the technic that was used in obtaining practically all of the specimens for the work represented. Over fifty bacteriologic examinations were ignored in endeavoring to arrive at a more satisfactory technic which is as follows:

1. Clip the hair closely within the vestibule and about the aperture of the nostril.

2. Wipe all secretion or other material from the vestibule and aperture.

3. Cleanse the area around the nasal apertures with alcohol.

4. Apply a 1:6,000 solution of epinephrine around the anterior third of the inferior turbinate and the adjacent septal area and naso-antral wall.

5. Spray the nose, especially under and around the inferior turbinate, anterior septal area and nasal floor, with a 1:2,500 metaphen solution, using a DeVilbis atomizer with a no. 56 thin postnasal spray tip, with a single opening.

6. Apply 5 per cent cocaine with a 1:6,000 dilution of epinephrine on a cotton applicator to the anterior nasal septal cartilage, and around the inferior turbinate.

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48. Bloomfield, A. L.: The Effect of Antiseptics on Bacterial Flora of the Upper Air Passages, Bull. Johns Hopkins Hosp. **34**:65 (Feb.) 1923.

49. Dean, L. W.: Recent Advances in Otolaryngology: Medical and Surgical Treatment, Ann. Otol., Rhin. & Laryng. **38**:952 (Dec.) 1929.

7. Follow this with a small cotton tampon moistened in a 1:6,000 epinephrine solution, with the excess expressed, and dipped in cocaine hydrochloride flakes. (Just enough moisture is allowed to remain to carry the cocaine crystals and not cause them to go into solution.) Pack the tampon lightly against the naso-antral wall at the proposed site of puncture and allow it to remain in situ for ten minutes.

8. Remove the tampon and spray as in step 5, with metaphen 1:2,500 applied three times at two minute intervals.

9. Apply metaphen ointment 1:500 to the naso-antral wall, under the inferior turbinate on the floor and around the anterior, completely covering the area. Allow it to remain for ten minutes. The ointment is used in a sterile glass syringe with a large Luer needle, the point of which has been cut off. The needle and nasal speculum, syringe, forceps, Coakley antrum trocar and cannula were autoclaved to ensure asepsis.

10. The culture is taken at the proposed site of antral puncture using my special brass tube, which is 5½ inches long, curved on the end, similar to the Coakley trocar, and carrying a brass wire milled to hold cotton at the end. The wire-tipped cotton is withdrawn about 3 or 4 mm. into the tube to allow for a space at the end to be filled with autoclaved sterile petrolatum. The curved end of the tube, thus prepared, is pushed through the 1:500 metaphen ointment to the site of antral puncture in close contact with the mucous membrane. The wire is pushed

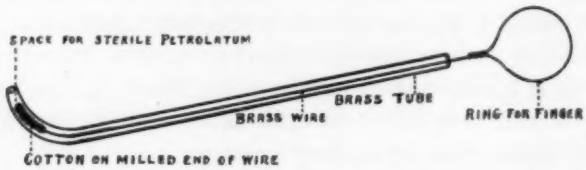

Fig. 1.—Tube used in taking culture at the site of antral puncture.

through the tube which is held firmly against the naso-antral wall and made to engage the mucous membrane thoroughly. The plug of autoclaved sterile petrolatum prevents contamination on the way to the site of antral puncture, and is dislodged when the culture wire is pushed through to engage the mucosa. The wire is withdrawn into the tube 4 or 5 mm. before its removal. Then the tube and contents are withdrawn. Following this the top of the tube is flamed, the wire completely withdrawn and cultures made.

11. Insert an autoclaved Coakley trocar into the same relative position as that occupied by the culture tube in step 10, and perforate the naso-antral wall after the trocar has been withdrawn 4 or 5 mm. up the cannula; a plug of autoclaved sterile petrolatum is used in the end of the trocar as in the culture tube. Remove the trocar, connect a cannula and a 20 cc. Luer syringe and inject physiologic solution of sodium chloride, using 15 cc. if possible, keeping the head tipped to the same side, being mindful of the position of the natural openings and accessory, and avoiding the escape of fluid through them. Withdraw as much as possible and reinject it into the sinus three times. Then the washings are withdrawn and transferred to a sterile test tube, ready to be cultured.

12. Tip the head to the opposite side and gently blow the remaining salt solution from the sinus.

Tube.—The tube consists of a hollow brass tube bent similar to a Coakley antrum trocar, 5½ inches long and one-tenth inch in diameter, carrying a brass

wire, milled at the extremity to hold cotton firmly. The tube protects the cotton swab from outside contamination when the culture is being taken. Each tube enclosing the wire with cotton attached is autoclaved in a separate large test tube.

Anesthesia.—All antrums were investigated under local anesthesia, using cocaine hydrochloride flakes as described (and not using cocaine mud, which is unnecessary, is no more effective and is not without danger). A profound anesthesia will result if the drug is used as suggested. No cocaine reactions were encountered and the amount of anesthetic used was infinitesimal. (Cocaine solutions are readily absorbed into the general circulation and general toxic reactions are very prone to follow. Further, approximately thirty times the amount of cocaine is used when the 10 per cent solution is employed, the anesthesia is easily dissipated and is not profound. I am not considering cocaine mud.)

As soon as the control cultures were taken, they were inoculated into 0.1 per cent dextrose infusion broth to be grown aerobically. Only specimens with negative control cultures were used in this work. The nasal speculum, forceps, Coakley trocar and Luer syringe used in obtaining specimens were sterilized by autoclaving in a separate kit for use in each case.

Method.—Washings obtained from the perforated antrum were treated in the following manner: The initial growth was obtained on blood agar and in hormone broth, cultures being grown aerobically, anaerobically and in partial carbon dioxide tension. In a few cases 0.1 per cent of dextrose infusion broth was substituted for hormone broth, the results of isolating organisms being about the same as those obtained with hormone broth. Mediums were inoculated with washings by means of sterile pipets.

For anaerobic growth, a Varney jar was used and cultures were grown from two to six weeks in an attempt to isolate obligate anaerobes. The objection to the Varney jar was that quite a large percentage of contamination was obtained on prolonged cultivation.

Partial carbon dioxide tension was tried in order to create oxygen condition similar to that in the human body, in case there were organisms that could not withstand a change to the artificial aerobic growth. Ten per cent partial carbon dioxide tension was obtained by placing a definite amount of sodium bicarbonate in 10 per cent sulphuric acid; in the reaction that followed, carbon dioxide was liberated. In order to prevent the escape of carbon dioxide that forms as soon as sodium bicarbonate comes in contact with the acid, sodium bicarbonate was placed in a gelatin capsule, which was then dropped into a test tube with acid. To prevent the loss of carbon dioxide in the air, the jar in which cultures were to be grown was at once closed tightly. The reaction between sodium bicarbonate and the acid proceeded more

slowly because of the gelatin capsule. The amount of sodium bicarbonate used was measured in the following way:

The gram-molecular weight of any gas occupies 22.4 liters at the pressure of one atmosphere. The molecular weight of sodium bicarbonate is 84.008; this when treated with acid liberates 1 mol of carbon dioxide; therefore 1 cc. of carbon dioxide is given off by each 0.00375 Gm. of sodium bicarbonate. The capacity of the jar is then measured, and the amount of sodium bicarbonate necessary to liberate carbon dioxide to bring the carbon dioxide contents of the jar to 10 per cent is calculated.

At first, desiccators were used for the partial carbon dioxide tension cultivation, but as they could not be sterilized, they were discarded; too large a percentage of contamination, especially with molds, was obtained. Wide-mouthed bottles, with tightly fitting corks, were substituted and found to be more satisfactory, as chances for contamination were reduced, since these bottles could be autoclaved before use. Glycerin was placed around the cork to prevent the escape of carbon dioxide through it. Blood agar slants were used in these bottles, blood agar plates being too large for them. Blood agar plates were used in aerobic and anaerobic cultivation. Ten per cent sheep blood sugar was used throughout this work.

The hormone broth used was prepared as follows:

1. Cut beef heart free from fat and grind. To each 400 Gm. add 1 liter of water, and let the mixture stand overnight in a cold room.
2. Add 1 per cent peptone and 0.5 per cent of salt.
3. Heat over free flame and boil from ten to fifteen minutes. Strain through wire gauze.
4. Add 24 cc. of normal sodium hydroxide per liter to adjust the p_H to about 76. Check the p_H.
5. Autoclave in flasks with cotton plugs at 15 pounds for fifteen minutes (fifteen minutes in the autoclave for each liter in the same container).
6. Allow to stand to form sediment (usually overnight).
7. Siphon clear broth from the sediment and fat.
8. Place the broth in a flask and autoclave at 15 pounds for fifteen minutes to keep as a stock.
9. Add 1 per cent of gelatin to the broth before using it.
10. Place in a tube and autoclave at 15 pounds for ten minutes. Check the final p_H, which should be around 7.4.

After the initial growth was obtained, the organisms were transplanted to the different mediums necessary for their identification and carried through until properly classified. Streptococci were classified according to Holman's classification.

It was noticed that streptococci grown initially on different mediums, but obtained from the same antrum, gave on the first transplantation

different sugar reactions, which might have come to an equilibrium in some cases after the organisms had been grown on the artificial mediums for a few generations. This fact was noticed, however, only with organisms grown in different mediums, but in the same atmosphere requirements; in case of cultivation in a different atmosphere, the strains held to their own sugar reactions, which was an indication of the fact that different strains were isolated by different methods of cultivation.

RESULTS

Table 1 shows cases reported clinically normal. It will be seen that the cultures were sterile in thirteen cases, ten of which gave absolutely clear washings (21 per cent of the total cases or 27 per cent of the cases with clear washings). One showed a few flakes and was sterile, and two were slightly turbid and sterile. It will be noted, then, as in this instance, *turbidity is not a diagnostic proof of infection.*

TABLE 1.—*Results in Antrums Reported Clinically Normal* *

Number, Sex, Age	Transillumination	Roentgenography	Naso-Antral Wall	Washings (Antral)	Patency of Ostium Maxillare and Accessory Openings	Cultures	
						Sterile	Positive
21, ♂	Opaque..... 24	Positive. 10	Thick..... 11	Transparent 37	Patent....40	13	34
24 to 66;	Transparent 22	Negative 30	Very thick 6	Opaque..... 10	Nonpatent 7		
26, ♀	?..... 1	?..... 2	Thin..... 30				
15 to 55		None.... 5					

* Résumé of original table.

Twenty-seven of the remaining clear cases, or 72 per cent, showed positive cultures. These were patients who had no symptoms referable to the sinus. It will be noticed in tables 1 and 2 that the pneumococcus was absent in all of the cases having clear washings. An abundance of staphylococci were present with clear and transparent washings. In table 2 there were nine sterile cases, five of which were absolutely clear (9 per cent of the total number of cases or 21 per cent of the cases with clear washings), four cases with turbid and sterile washings and twenty-one cases with absolutely clear washings and positive cultures, or 80.76 per cent. *Again it will be noticed that perfectly clear transparent washings are not criteria as to whether or not the washings are positive or negative.* The pneumococcus was absent in all the clear cases of this series and an abundance of staphylococci were present with clear washings.

The tables are self-explanatory and one may see at a glance the information at hand. In table 1 four cases, and in table 2 six cases,

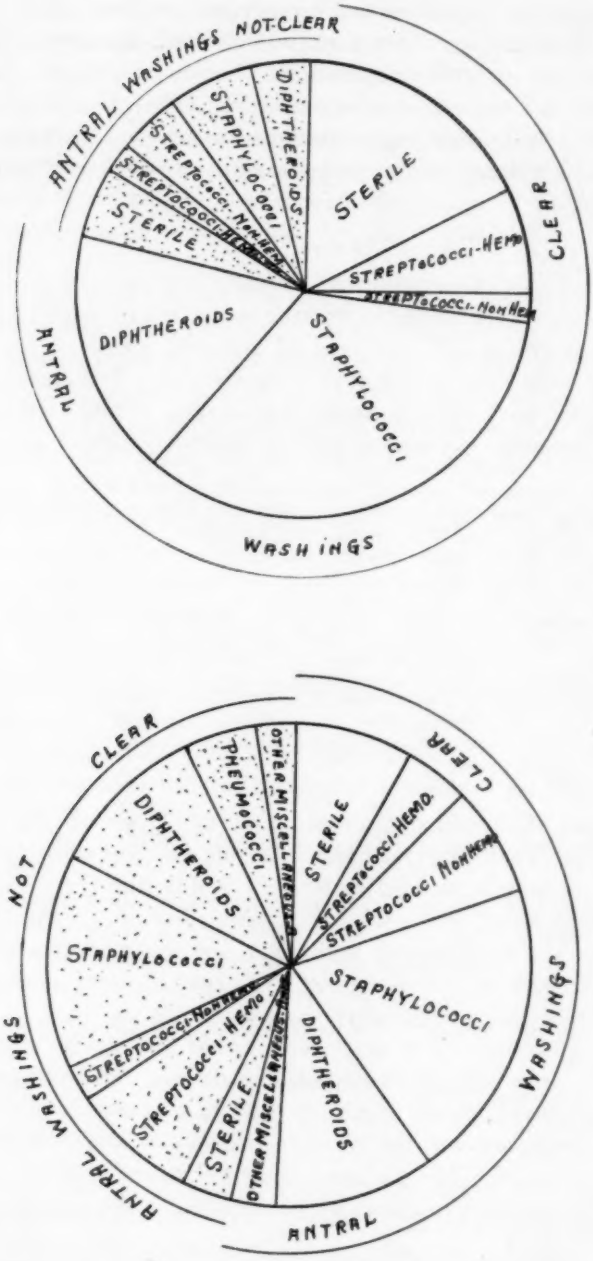

Fig. 2.—Results of bacteriologic examinations.

with clear washings contained streptococci, either alone or in combination with other bacteria. Table 3 shows: cases reported clinically normal and clinically diseased, in which there were negative and clear washings macroscopically and bacteria were found; cases reported clini-

TABLE 2.—*Results in Antrums Reported Clinically Diseased* *

Number, Sex, Age	Transillumination	Roentgenography	Naso-Antral Wall	Washings (Nasal)	Patency of Ostium Maxillare and Accessory Openings	Cultures	
						Sterile	Positive
34, ♂	Opaque..... 48	Positive. 32	Thick..... 20	Transparent 26	Patent....37	9	44
23 to 66;	Transparent 3	Negative 7	Very thick 6	Opaque..... 27	Nonpatent16		
19, ♀	?..... 2	?..... 7	Thin..... 27				
15 to 45		None.... 7					

* Résumé of original table.

TABLE 3.—*Bacteria Found in Cases With and Without Clear Washings* *

	Streptococci, Hemolytic	Streptococci, Nonhemolytic	Staphylococci	Diphtheroids	Pneumococci	Miscellaneous Bacteria
Normal cases (clinically):						
Washings clear and bacteria found; number of cases.....	4	1	22	11	..	..
Total number of cases with clear washings and positive cultures: 27						
Total number of cases with clear washings and sterile cultures: 10						
Cases with diseased antrums (clinically):						
Washings clear and bacteria found; number of cases.....	3	4	12	7	..	2
Total number of cases with clear washings and positive cultures: 21						
Total number of cases with clear washings and sterile cultures: 5						
Normal cases (clinically):						
Washings not clear and bacteria found; number of cases	1	2	5	3	..	..
Total number of cases with washings not clear and positive cultures: 7						
Washings not clear and cultures sterile: 3						
Cases with diseased antrums (clinically):						
Washings not clear and bacteria found	10	2	17	11	5	5
Total number of cases with washings not clear and positive cultures: 23						
Washings not clear and cultures sterile: 4						

* Résumé of original tables 3, 4 and 5.

cally normal and clinically diseased, respectively, in which the washings were not clear and bacteria were found. Table 4 shows a summary of cases with macroscopically negative and clear antral washings and the bacteriologic data on normal and diseased antrums, with the percent-

TABLE 4.—*Summary of Cases with Microscopically Negative and Clear Antral Washings and Bacteriologic Data*

	No. Cases	Total Number Sterile	No. Cases with Clear Washings	No. Antral Washings Clear and Cultures Sterile	No. Cases with Clear Washings and Cultures Positive	Streptococci, Hemolytic	Streptococci, Nonhemolytic	Staphylococci	Diphtheroids	Pneumococci	Miscellaneous Bacteria
Antrums reported clinically normal	47	13 or 27.65% (10 clear, 3 turbid)	37 or 74.46%	10 or 21.27% of total number; 27.02% with clear washings	Total, 47; 37 of these were clear and 10 sterile; 27 with positive cultures or 72.97%	4 or 8.51% of total number; 10.81% with clear washings	1 or 2.12% of total number; 2.70% with clear washings	22 or 44.68% of total number; 59.45% with clear washings	11 or 23.40% of total number; 29.72% with clear washings	0	0
Antrums reported clinically diseased	53	8 or 16.98%	26 or 49.05%	5 or 9.43% of total number; 19.23% were clear washings	Total, 53; 26 of these were clear and 5 sterile; 21 with positive cultures (80.76%)	3 or 5.66% of total number; 11.53% with clear washings	5 or 9.43% of total number; 19.23% with clear washings	17 or 32.07% of total number; 65.38% with clear washings	11 or 20.75% of total number; 42.30% with clear washings	0	2 or 3.77% of total number; 7.69% with clear washings
Total.....	100	22	63	15	Average, 76%	7	6	39	22	0	2

TABLE 5.—*Summary of Cases with Washings not Clear and Bacteriologic Data*

	No. Cases	Total Number Sterile	Number with Turbid Washings	Number Cases with Washings not Clear and Sterile	No. Cases with Turbid Washings and Cultures Positive	Streptococci, Hemolytic	Streptococci, Nonhemolytic	Staphylococci	Diphtheroids	Pneumococci	Miscellaneous Bacteria
Antrums reported clinically normal	47	13 or 27.65%	10 or 21.27%	3 or 6.38% of total number; 30% of cases with turbid washings	Total, 47; 10 turbid, of which 3 were sterile, leaving 37 with positive cultures (14.89%)	1 or 2.12% of total number; 10% with turbid washings	3 or 6.38% of total number; 30% with turbid washings	5 or 10.63% of total number; 50% with turbid washings	3 or 6.38% of total number; 30% with turbid washings	0	0
Antrums reported clinically diseased	53	9 or 16.98%	27 or 50.94%	5 or 7.54% of total number; 14.81% of cases with turbid washings	Total, 53; 27 turbid, of which 4 were sterile, leaving 23 with positive cultures (43.58%)	10 or 18.86% of total number; 37.03% with turbid washings	2 or 3.77% of total number; 7.40% with turbid washings	17 or 32.07% of total number; 62.95% with turbid washings	11 or 20.75% of total number; 40.74% with turbid washings	5 or 9.43% of total number; 18.51% with turbid washings	3 or 5.66% of total number; 11.11% with turbid washings
Total.....	100	22	37	7	Average, 57%	11	5	22	14	5	3

ages. Table 5 shows a summary of cases with washings not clear in normal and diseased antrums, with percentages. Figure 2 is a graphic representation of the cases, giving a bird's-eye view of the results of bacteriologic examination, with percentages. Tables 6 and 7 are self-explanatory.

TABLE 6.—*Results of Antral Cultures*

Type	Number	Positive	
		Number	Per Cent
Normal	47	34	72.34
Acute	1	1	100.00
Subacute	2	2	100.00
Chronic	50	41	82.00
Total	100	78	78.00

TABLE 7.—*Organisms According to Antrum Types* *

Type	Sterile; No Bacteria	Streptococci, Hemolytic	Streptococci, Nonhemolytic	Streptococci, Unidentified	Staphylococcus Aureus	Staphylococcus Albus	Staphylococcus Citreus	Micrococci	Sarcina	Pneumococci	B. Proteus	Unidentified Fusiform Bacillus	Mucosus Capsulatus Group	Subtilis Group	Diphtheroids
Normal	13 (sterile)	5	3	1	1	26	1	1	..	..	..	..	..	..	16
Acute	0	..	..	..	..	1	..	..	..	..	..	..	..	..	..
Subacute	0	1	..	..	1	2	1	..	..	..	..	..	..	..	3
Chronic	9 (sterile)	19	7	..	8	23	..	1	1	5	1	1	1	2	20
Total organisms	0	25	10	1	10	52	2	2	1	5	1	1	1	2	39

* No obligate anaerobic organisms were cultured, none being present.

COMMENT

Men with matured opinions, for example, Hajek [50] and Shambaugh,[51] have maintained that clear and transparent antral washings were diagnostic of an antrum free from disease; in fact, clear washings are universally interpreted as being negative. This study proves the fallacy of such an opinion and makes it appear doubtful. No doubt, the necessity of macroscopic evidence of an opaque or turbid secretion is an appre-

50. Hajek, M.: Pathology and Treatment of the Inflammatory Diseases of the Nasal Accessory Sinuses, Trans., ed. 5, St. Louis, C. V. Mosby Company 1926.

51. Shambaugh, G. E.: Infection of the Maxillary Antrum, J. Am. Dent. A. **16**:773 (May) 1929.

ciation of the so-called laudable pus of our preceptors. General surgeons are well acquainted with the significance of a thin watery secretion, which may be transparent, especially when associated with lymphangitis and rapid toxemia.

It was Mosher [52] who said: "There are enough unsolved problems in otolaryngology to satisfy the ambitions of anyone." The proper handling of sinuses is a problem far from being solved. Any procedure that will aid in putting sinuology on a more definite basis should be most welcome.

Skillern [35] said: "The growth of sinuology from the tooth infected antrum, to be recognized as the causative factor of disturbed conditions in remote portions of the body, has been a comparatively rapid process in which American Medicine has played no small part." Many new operative modifications have been devised from time to time, but means of making a more exacting diagnosis have been very few.

Proetz [53] said, in writing of "The Sinus in Perspective": "If one pause in the daily routine of his combat against sinus disease, and survey the present state of knowledge and practice of sinuology as impersonally as may be, the prospect is disquieting. One has become so accustomed to the bewildering collection of facts, theories and superstitions of which textbooks are made, that it is difficult to reduce them to the few simple elements of which they really consist. We know discouragingly little about sinuses, and only exert a feeble influence upon their welfare."

The cytologic examination of the antrum and procedures exemplified by Watson and Williams,[33] Sewall,[54] Coates and Ersner,[55] Ersner,[56] and Sewall and Hunnicutt [57] are commendable. They do not depend on the macroscopic appearance of secretion to tell the story, but represent real scientific evidence.

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52. Mosher, H.: Ann. Otol., Rhin. & Laryng. **34**:273, 1925.

53. Proetz, A. W.: The Sinus in Perspective, Ann. Otol. Rhin. & Laryng. **38**:682, 1929.

54. Sewall, E. C.: Diagnosis and Treatment of Chronic Maxillary Sinus Infection, Arch. Otolaryng. **8**:405 (Oct.) 1928.

55. Coates, G. M., and Ersner, M. S., Occurrence of Eosinophils in the Mucous Membrane of the Maxillary Sinus in Asthmatic Patients, Arch. Otolaryng. **11**: 158 (Feb.) 1930.

56. Ersner, M. S.: Diagnosis of Antral Infection, Ann. Otol. Rhin. & Laryng. **38**:87 (March) 1929.

57. Sewall, E. C., and Hunnicutt, L.: Cytologic Examination of the Antrum, Arch. Otolaryng. **10**:1 (July) 1929.

Clinical and histopathologic studies, as reported by Hansel,[58] Mullen,[59] etc., and studies in anaphylaxis and allergy, such as those by Coates,[60] Emerson,[61] Dean [49] and Eyermann,[62] are real contributions.

The relation of a deficiency diet to diseases of the sinuses, as reported by Dean,[49] Daniels,[63] Shurley [64] and Turner,[2] represents progress in the field of sinuology.

It is possible that one is so absorbed in looking for new avenues of approach that one is prone to overlook a procedure such as that considered here.

Dr. J. Gordon Wilson,[65] in a personal interview, was interested to know the relation of conditions such as arthritis to those antrums in which the washings were clear and no other foci of infection could be located. He would welcome any procedure that would favor a more exact diagnosis before any operative procedure was undertaken.

C. B. Younger [66] thought that the evidence of clear washings containing pathogenic bacteria was of great diagnostic importance and worthy of emphasis.

Otis Maclay [67] referred to a case in which there was no macroscopic evidence of secretion, the washings being perfectly clear, and in which he found a complete cessation of toxic symptoms following irrigation.

If the secretions are clear, one is not justified in operative procedures before additional laboratory means of diagnosis have been used. It is quite possible that some diagnostic failures may be responsible for the group of persons classified as hypochrondriacs.

The statement so frequently made following irrigations of the antrums, "No pus present in the washings," is a very *loose conception*

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58. Hansel, F. K.: Clinical and Histopathologic Studies of the Nose and Sinuses in Allergy, J. Allergy **1**:43, 1929.

59. Mullen, W. V., and Ball, R. P.: Studies of Pathologic Tissue Removed from Chronically Infected Nasal Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **37**:192, 1928.

60. Coates, G. M.: The Rhinologic Aspects of Allergy, Ann. Otol. Rhin. & Laryng. **35**:723, 1926.

61. Emerson, F. P.: Anaphylaxis and Allergy in Rhinology, Ann. Otol., Rhin. & Laryng. **38**:313, 1929.

62. Eyermann, C. H.: The Diagnosis of Allergy, J. Missouri M. A. **26**:481, 1929.

63. Daniels, A. L.; Armstrong, M. E., and Hutton, M. K.: Nasal Sinusitis Produced by Diets Deficient in Fat-Soluble A Vitamin, J. A. M. A. **81**:828 (Sept. 8) 1923.

64. Shurley, B. R., and Turner, R. G.: Infection of Accessory Sinuses and Upper Respiratory Tract in Vitamin A Deficiency, J. A. M. A. **94**:539 (Feb. 22) 1930.

65. Wilson, J. Gordon: Personal communication to the author.

66. Younger, C. B.: Personal communication to the author.

67. Maclay, Otis: Personal communication to the author.

as to whether or not an antrum is free from infection. It is not essential that the secretion is thick, creamy or opaque to contain virulent pathogenic bacteria; in fact, as shown, it may be perfectly *clear and be very virulent, and yet the gross appearance of the washings continues to be the usual method of diagnosis despite knowledge to the contrary.* The practice of using a black basin offers nothing.

The autosterilizing power of the nasal mucous membrane, as studied by Arnold, Ostrom and Singer,[45] shows the average rate of disappearance of bacteria after spraying of the nasal mucous membranes with known viable bacterial cultures. They made four hundred tests on forty-two normal persons. They introduced on an average of twenty million bacteria and found that within 90 to 95 per cent were rendered nonviable within five to ten minutes. Many successive seedings of the same bacteria were placed within the nose with no apparent exhaustion of the disinfecting mechanism. Environmental studies were also studied and the results recorded.

However, attention to the physiologic performance of the nose is essential, and especially the condition of the middle meatus and adjacent structures.

It is generally accepted that in order for a sinus to function properly, it is essential that there be the proper ventilation and aeration. It has been proved that the sinus, under normal circumstances, is aerated during every respiration. Therefore, it is reasonable to assume that bacteria find their way into the sinuses. It has also been shown that the cilia of healthy sinus mucous membrane immediately begin to expel the bacteria. McDonald [68] has demonstrated the activity of the ciliated epithelium.

The patency of the maxillary ostium and accessory openings is prerequisite, as ventilation, aeration and drainage are the keynote to the proper functioning of a healthy sinus. Wilson,[65] Gleason,[69] Shambaugh,[51] Hajek,[50] Andrews [70] and others have constantly referred to the matter of ventilation, aeration and drainage.

The question of anaerobic bacteria and the part taken by saprophytic bacteria seems to play a lesser rôle than I formerly presumed. No doubt, the occlusion of the natural openings with the resultant negative pressure and production of secretion in the sinus would act as a favorable culture medium for bacteria that happened to be present on account

68. McDonald, J. F.; Leisure, C. E., and Lenneman, E. E.: New Principles in the Control of the Activity of Ciliated Epithelium, Tr. Am. Acad. Ophth. **33**:318, 1928.

69. Gleason, E. B.: Manual of Diseases of the Nose and Throat and Ear, ed. 4, Philadelphia, W. B. Saunders Company, 1918.

70. Andrews, A. H.: Personal communication to the author.

of the disturbed functions that were responsible for the closure. Efforts to find anaerobic bacteria gave essentially negative results in that no obligate anaerobic bacteria were found.

It is possible for bacteria to be present within the tissues and the washings to be culturally negative.

No special deductions can be made from the group of general cases, such as asthma, arthritis, bronchitis, cardiac cases, etc., owing to the small number in each group examined. I am planning to deal similarly with a large group of each of the more important classes.

Bacteriologically, *Staphylococcus albus* seems to be the predominating organism, with diphtheroids second and streptococci occupying third place. The sinuses reported clinically normal were not investigated prior to this investigation and are classified as negative on clinical examination and observation; they are therefore not essentially normal in the true sense. Twenty-three per cent of all streptococci were isolated from this group. The results of an endeavor to obtain control cultures free from bacteria at the site of antral puncture preliminary to entering the sinus for culture would indicate that the nose is not free from bacteria, especially about the site of antral puncture.

In general, the observations differ from many others in the fact that fewer types of organisms were isolated, and they agree in finding staphylococci and streptococci to be the predominating organisms in inflammatory processes. Fewer pneumococci were isolated than would be anticipated, and no influenza bacilli, probably due to the fact that they succumbed in favor of the more vigorous bacteria referred to, namely, the staphylococci, streptococci and diphtheroids.

CONCLUSIONS

1. Under normal circumstances the maxillary antrums are free from bacteria.

2. The macroscopic appearance of antral washings is essentially untrustworthy; 76 per cent of all the cases in this report were found to be bacteriologically positive, yet the "washings returned clear."

3. No obligate anaerobic bacteria were isolated, showing that the presence of a true anaerobic condition in the antrums is very unlikely.

4. Four organisms are most commonly encountered in inflammatory processes, namely, staphylococci, streptococci, diphtheroids and pneumococci.

5. The technic as herein described apparently permits of a negative preliminary control culture and a culture of the antral contents free from contamination from without.

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Miss Marion Raskin did the bacteriologic laboratory work.

PLASTIC SURGERY OF THE NOSE*

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In presenting this subject only procedures of known value for repair of the various deformities will be given, in accord with my experience at the Newark Eye and Ear Infirmary. No attempt will be made to tabulate the numerous operations recommended in textbooks on plastic surgery. The wide scope of the subject will necessitate limitation to the more common nasal deformities without discussion of minor cosmetic repairs, the syphilitic nose or complete loss of the nose.

Plastic surgery of the external nose may be divided into two main classes: (1) correction of nasal deformities in which all the normal elements of the nose are present but not in their proper position; (2) correction of nasal deformities in which some portion of the nose is absent. The first type of deformity is usually corrected by rearranging the bone and cartilage of the nose without utilizing tissue from other parts of the body. In the second type the missing parts must be replaced. A list of the common deformities of these two types is as follows:

1. Normal elements present
   - (*a*) Bony bridge
     - (1) depression
     - (2) spur
     - (3) exostosis
     - (4) twist
   - (*b*) Septal cartilage
     - (1) depression (saddle)
     - (2) spur
     - (3) deviation
     - (4) twist
2. Some of normal elements absent
   - (*a*) Deep depression of bony bridge
   - (*b*) Deep depression of cartilaginous bridge
   - (*c*) Loss of external substance of nose

The deformities most often occur in combination, e. g., a hump with a saddle or a depressed bony bridge with a twisted cartilage.

PROCEDURE

In planning the operation it is important to make sure that a high deviation of the septal cartilage does not exist. This, if present, will serve as a bumper and prevent the bringing together and straightening of the bony bridge after it has

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* From the Plastic Surgery Department, Newark Eye and Ear Infirmary.

been refractured. When such a deviation exists a submucous resection must first be performed to remove the obstacle. If a twist is present in the septal cartilage, causing lateral displacement of the lower part of the nose, a difficult problem is presented. It will be found that a simple fracture and alinement of the bony bridge does not straighten the lower portion of the nose, which is held to the side by the twisted cartilaginous septum. In these cases I remove as much of the twisted septal cartilage along the bridge of the nose as is necessary to bring it over in the midline without regard for the support of the nose. The resulting saddle is filled in later by the procedure used for any depressed nose. Displacement of the tip is corrected by resetting the cartilage in the midline. A submucous resection and rhinoplasty are never combined at the same operation as infection occurs more frequently when they are undertaken together. Those cases in which a submucous resection and later rhinoplasty are done rarely show infections. An autogenous immunity against bacteria is probably established in the nose after the first operation, which protects the tissues against these organisms during a second operation.

Fig. 1.—*A*, this patient has a hump over the bony bridge and a partial saddle of the cartilaginous bridge. There is also some depression of the nasal tip. *B*, the same patient after operation.

Repair When Normal Elements of Nose Are Present.—In rhinoplastic operations I use the alar incision. If a depression of the nose is to be filled, the upper two thirds of the lower lateral cartilages are removed and placed in a dry sponge for later use (Sheehan [1]). Sufficient cartilage should be left about the free margins of the nostrils to insure support. The skin of the nose is then freed by scissor dissection from the deeper portion through the alar incision, first on one side and then on the other. Care must be taken not to cut the median palpebral ligament attaching the upper and lower tarsus of the eyelids to the bony bridge. After the skin has been detached, the periosteum is peeled down on either side from the bony bridge, and the operator is now ready to begin the repair. Spurs and exostoses are cut away with the chisel, and the bone is smoothed down with a rasp. The bony bridge must be fractured and pressed together where the removal of a spur has caused a groove or where there exists a depression, broadening or twist of the bony bridge. This fracture is made with a chisel and begins low, through the nasal process of the superior maxilla. Care must be taken to sever the bridge close to its attachment with the maxilla or an unsightly ridge beside the

1. Sheehan, J. Eastman: Reconstructive Surgery, Arch. Otolaryng. **7**:299 (April) 1928.

nose will result. When both nasal processes have been fractured the bones are pressed together, causing a narrowing and elevation of the bony bridge. If the fracture is carried too far up and laterally, injury will occur to the lacrimal sac, resulting in a discharging fistula. If the bridge is twisted, the fractured bones are rearranged in the correct position. A depression is filled by means of sections of lower lateral cartilage placed one on top of the other and sutured together. This graft may be reenforced by cartilage from the auricle when it does not completely fill the defect. A mattress suture passing through the nose beneath the graft holds it in place.

Repair When Some Nasal Elements Are Absent.—1. The repair of deep depressions of the bony and cartilaginous bridge is the same as that of the shallow variety, but the lower lateral cartilages and ear cartilage do not possess sufficient bulk to fill in the hollow. A rib cartilage is ideal in such cases, and the clinical evidence of its permanence, when buried beneath the skin, has been shown experimentally by Davis.[2] The nasal processes of the superior maxilla are first fractured to provide a base for the graft to rest on. After two weeks have elapsed, the rib cartilage is inserted through the columella so as to rest on the newly formed bony bridge. Infection will occur less frequently when the two-stage operation is used.

Fig. 2.—*A*, pedicle flap swung down from forehead and sutured so as to replace loss of nasal substance. *B*, the pedicle has been severed and the central end used to cover a portion of the denuded forehead. The remainder of the forehead defect has been closed by undermining the skin and bringing the edges together. The photograph is taken with sutures in place to indicate more clearly the procedure.

2. Cases of partial loss of the external tissues of the nose usually result from automobile accidents in which a portion of the nose is sliced off by glass from the windshield. Many methods of repair are recommended, but I have found full thickness pedicle grafts most successful. These are of two types: (*a*) the forehead flap and (*b*) the tube flap.

2. Davis, Staige: Some of the Problems of Plastic Surgery, Ann. Surg. **66**:88 (July) 1917.

Forehead Flaps: The forehead graft is cut with the pedicle attached in the region of the supra-orbital vessels and is immediately sutured to cover the defect of the nose. This method is successful because the supra-orbital vessels supplying the flap are sufficient for its nourishment until new vessels have grown into the portion fastened to the nose. The denuded area on the forehead is covered by a full thickness graft from the abdomen, or the edges of the skin are undermined and brought together. This method always leaves some scarring, but the skin is a perfect match in color and texture with the nasal skin.

Tube Flaps: The formation and use of tube flaps have been fully described in a previous article.[3] They consist of a tube of skin containing its subcutaneous layer of fat. The skin is connected at each end with the adjacent surface of the skin much as the handle of a suit-case is connected with the suit-case. The handle or tube receives its blood supply through each of these attachments. The end which is later to be severed and attached in a new area is called the "distal" end and the portion that is left in place to furnish nourishment until the distal portion can support itself is called the "central" end. The procedure whereby the distal end is partly cut through and sutured back in place is called "delaying" the

Fig. 3.—*A*, tube flap from the skin of the arm: *a*, central end; *b*, distal end. *B*, the distal end has been sutured to cover nasal defect with arm elevated and bandaged to the head.

tube flap. This is always advisable, as it causes the central attachment to furnish more blood and prepares it for entire support of the tube when the distal end is completely severed. In nasal repair, tube flaps are formed on the arm or neck and allowed to remain in position for two weeks. The distal end is then delayed and a week later completely detached. The arm is now elevated and bandaged to the head so that the distal end can be fastened to the nose without undue tension. After the graft has been in its new location for a week to ten days, the tube is severed and the arm gently lowered to the side. The portion covering the nasal defect is shaped and sutured to the surrounding nasal skin margin. When a neck flap is used, the tube must be migrated into position. Obviously, in a man the neck could not be used, as the skin contains hair which would be unsightly on the nose. In general, I have found that the tube flap formed on the arm is best suited to replace the loss of substance of the nose, provided the skin matches reasonably well. In women the neck may be used, but the forehead is not desirable because of scarring.

3. Peer, Lyndon A.: Tube Flaps in Reconstructive Surgery of the Face, J. M. Soc. New Jersey **28**:86 (Feb.) 1931.

SUMMARY

1. Nasal deformities may be divided into two main classes: those in which all the normal nasal elements are present and those in which there is a loss of some of the elements.

2. A high deviation in the cartilaginous septum will prevent straightening of the bony bridge.

3. In lateral displacements of the lower part of the nose, the cartilage causing this displacement must be removed.

4. A submucous resection and rhinoplasty are never combined at the same operation.

5. When a submucous resection is performed first, an auto-immunity probably develops. This apparently protects the patient against infection during the second operation.

6. Depressions are filled with lower lateral cartilage, ear cartilage or rib cartilage, depending on their depth.

7. A tube flap from the arm is best suited for the repair of partial loss of the external nose.

RETROPHARYNGEAL ABSCESS

NEWER METHODS OF DIAGNOSIS AND TREATMENT*

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UNIVERSITY, VA.

Abscess of the retropharyngeal space is of fairly frequent occurrence and may lead to serious consequences unless recognized and properly treated.

The condition may occur at any age, but it is most frequently found during the first few years of life, because it is during this period that the retropharyngeal lymph glands are most marked. During this period also, the responsibility of diagnosis falls more heavily on the physician, since in later life the symptoms, as given by the patient, naturally lead to the consideration of this condition.

Any preexisting infection about the upper respiratory tract may be the exciting cause, such as acute rhinitis, nasopharyngitis, sinusitis, the exanthems, etc., which are accompanied by a retropharyngeal adenitis and the possibility of suppuration in one or more nodes. Other causes are encountered less often, such as direct trauma, perforating foreign bodies, tuberculosis and osteomyelitis of the cervical vertebrae and, in one recent case, tularemia.

The diagnosis is usually readily made, yet a large number of cases are not diagnosed for a considerable period; it is chiefly this group that prompts me to discuss the subject. As a rule, the clinical picture is that of a rather sick infant who is in apparent pain; the mouth is open, and from it drools saliva; the head is kept forward, and the cervical muscles are more or less rigid. There may also be swelling of the neck externally on either side. Other prominent symptoms are dysphagia, changes in the voice, even dyspnea and perhaps local pain or pain referred to the ears. Last of all, inspection of the pharynx and careful palpation of the posterior pharyngeal wall will establish a diagnosis.

Palpation should be carefully done, because spontaneous rupture of the abscess may produce sudden death, owing to the flooding of the larynx with pus, since these abscesses often contain relatively large quantities of pus. In one infant, 3 weeks of age, 30 cc. of pus was recovered from the suction bottle, and in one adult, 160 cc. was recovered. When retropharyngeal abscess is not recognized, spontaneous rupture or burrowing downward of the abscess into the posterior mediastium may occur. In one unrecognized case that came to autopsy, the abscess

* Submitted for publication, May 23, 1931.

* Chairman's address before the Virginia Society of Otolaryngology and Ophthalmology, Richmond, Va., May 2, 1931.

had extended to the diaphragm. Cases have been reported in which death ensued as a result of erosion of the internal carotid artery, and still others in which the jugular veins had become thrombosed; aspiration pneumonia and suppuration of the lungs are other possible sequelae of this condition.

Since the publication, in 1930, of the "Monograph on Radiology of the Neck" by Dr. Percy D. Hay, Jr., I have made it a routine measure to take a lateral view of the neck in all cases referred for roentgen examination of the respiratory or upper gastro-intestinal tracts, and on several occasions unsuspected retropharyngeal abscesses have been discovered. I have studied the value of the lateral roentgenogram in

Fig. 1.—Lateral roentgenogram of the normal adult neck. Note the width of the body of the cervical vertebra as compared to that of the retropharyngeal space.

about twelve different conditions, among which were retropharyngeal abscess, diphtheria, tuberculosis, syphilis and other inflammations, and benign and malignant tumors and other conditions. As a result of the study, certain useful diagnostic observations have been drawn, but the greatest of these concern postpharyngeal abscess.

In reviewing the cases of retropharyngeal abscesses, which have numbered seventeen during the past six years, I found one case in an elderly woman who was admitted to the hospital in a semicomatose condition. She had diabetes, and because of certain nasal symptoms of sinusitis and difficulty in swallowing, a roentgenogram of the sinuses and cervical spine had been requested. The report on the roentgenogram of the cervical spine said that the findings were negative, yet a tre-

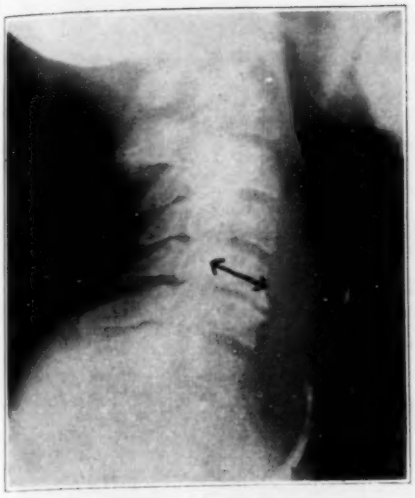

Figure 2

Figure 3

Fig. 2.—Retropharyngeal abscess in an adult. Note the marked increase of retropharyngeal space as compared to the width of the vertebra.

Fig. 3.—Roentgenogram of the patient in figure 2 taken eight days later; note that the relationship of the retropharyngeal space to the vertebra is approximately normal.

Figure 4

Figure 5

Fig. 4.—Tuberculosis of the cervical vertebrae, with crumpling, and the formation of a retropharyngeal abscess, containing gas bubble.

Fig. 5.—Marked retropharyngeal adenitis due to tularemia; no pus is present. Note the nodular outline of the pharyngeal wall as compared to the regular outline present during the formation of the abscess in figure 2.

mendous retropharyngeal and retro-esophageal abscess had been incised the same day. This report was made before Dr. Hay's work. However, on recent examination of this old roentgenogram, a tremendous bulging of the pharyngeal wall was apparent, and after five years the report had to be revised, for the findings certainly were not negative.

Fig. 6.—Roentgenogram of a normal child.

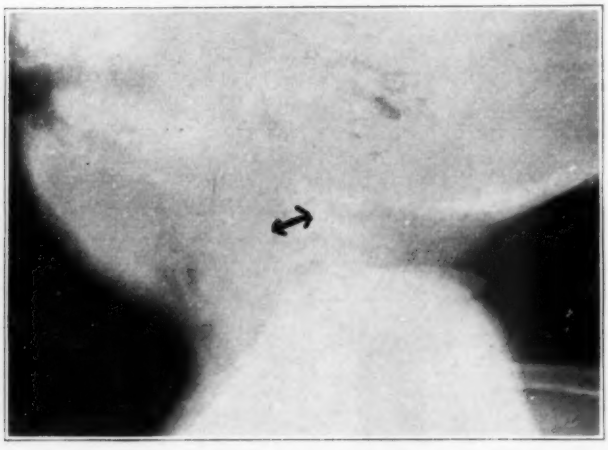

Fig. 7.—Retropharyngeal abscess in a child. Note the marked increase in the retropharyngeal space as compared to that in figure 6.

As early as 1914 Iglauer called attention to these roentgenologic findings, but unfortunately the value of his observation was lost in the literature until the subject was reinvestigated last year.

The first problem in this study was to establish a norm, and for this purpose the width of the midportion of the fifth cervical vertebra was used; this diameter was designated *C*, and all other measurements were made in relation to this unit. Certain landmarks may be readily located on the films, such as the tongue, the epiglottis, the hyoid bone,

the laryngeal cartilages, the trachea, the true and false vocal cords, the posterior pharyngeal wall, etc., which means that any measurement can be quickly and accurately made and stated in relation to the unit *C*. These measurements vary, however, between inspiration and expiration, and films should be made at both phases of respiration.

These normal measurements are given by Hay as follows: In males the average thickness of the wall running parallel to the vertebrae is 0.2 C., while in females it is 0.19 C. Other normal measurements are given and can be verified readily for any structure at any age.

When abscess is present, this space may measure from 2 to 3 C., and frequently the presence of gas in the pocket of the abscess is shown on the roentgenogram. Likewise, the progress of the condition after incision and drainage can be studied by the roentgen rays.

This work furnishes another useful diagnostic aid in the study of cervical and pharyngeal conditions, which will prove valuable to physicians in their daily work. The accompanying illustrations show the area studied in a normal child and in an adult and also the presence of an abscess in a child and in an adult in whose case the diagnosis was made by the use of roentgen rays, for the patient was referred from the medical clinic with a tentative diagnosis of esophageal obstruction. The roentgenograms also show a case of tuberculous abscess as a result of cervical caries, and one of an apparent abscess which did not yield pus on incision; in the latter case the cause of the marked adenitis was found to be tularemia.

Treatment for these abscesses is, of course, surgical; however, the following technic adds to the safety, cleanliness and exactness of the procedure. After the diagnosis has been made, the patient is placed on the table with the head and shoulders held well down over the end; then a laryngoscope is inserted in the mouth; the posterior pharyngeal wall is thoroughly inspected, the site for incision selected, and with a long-handled knife an incision is made, under vision, after which a suction tube is inserted and the cavity thoroughly aspirated. Daily inspection and massage of the area with the finger are then carried out until it has healed; roentgenograms may be made, if necessary, to study the progress of the condition.

CONCLUSIONS

1. Retropharyngeal abscess is not infrequent; early diagnosis is important, and neglected cases frequently lead to the death of the patient.

2. The lateral roentgenogram is an important aid in diagnosis and as a guide to the subsequent progress of the case.

3. The use of the laryngoscope and the suction tube greatly minimizes the danger and increases the accuracy of surgical operation.

MYRINGITIS BULLOSA

REPORT OF TWO CASES *

EDWARD F. ZIEGELMAN, M.D.
SAN FRANCISCO

The term myringitis bullosa is seldom encountered in American textbooks. Viennese otologists, particularly those of the Neumann school, describe it as a definite clinical disease and stress its differentiation and treatment. To understand their attitude requires thorough knowledge of the histology of the membrana tympani as well as of the pathologic conditions to which the structure is subject.

The drum membrane, that portion inferior to Shrapnell's membrane, has three definite layers: an external, modified, epidermal layer, a central fibrous layer and an internal mucous membrane continuous with the lining of the middle ear cavity (fig. 1).

From a histologic study of the drum membrane one can readily appreciate how trauma or, at times, infection localized in the fibrous tissue or external epidermic layer would cause a definite pathologic picture.

Influenzal infections may cause such a condition. The appearance (fig. 2) is similar to that seen in acute otitis media, so that it is necessary to guard against improper treatment. The one disease requires incision of the drum membrane; the other, palliative treatment or, at the most, a superficial incision to remove the subepidermal serous or seropurulent material.

In cases occurring as a result of influenza, the pathologic process is explained on the basis of toxins in the circulation that might have affinity for the drum membrane, and are brought through the vascular supply to this structure. Whether or not this is the true explanation, a definite clinical picture is presented. It is marked by excruciating pain in the affected ear, and is differentiated from otitis media by very slight, if any, loss of hearing. The very high temperature—frequently 104 F.—may lead one to suspect a serious disturbance of the middle ear. Visual inspection shows the drum membrane to be greatly reddened and angry in appearance, with all landmarks gone. On closer inspection with a Siegle's otoscope, one who has seen a few cases of this type immediately becomes suspicious that the case is not one of true otitis media but of a subepidermal collection of serous or seropurulent material. He is at once cautious of any mechanical interference other

* Submitted for publication, May 20, 1931.

than a superficial incision to remove the pathologic material. In doubtful cases delay is indicated, since an incision into a normal middle ear through a pathologic process of this kind usually infects the cavity and causes the development of acute otitis media. Palliative treatment with a mixture of phenol and glycerin or alcohol is satisfactory, though convalescence is slow. As a rule, the severe pain can be relieved almost immediately by a superficial incision into the bulla.

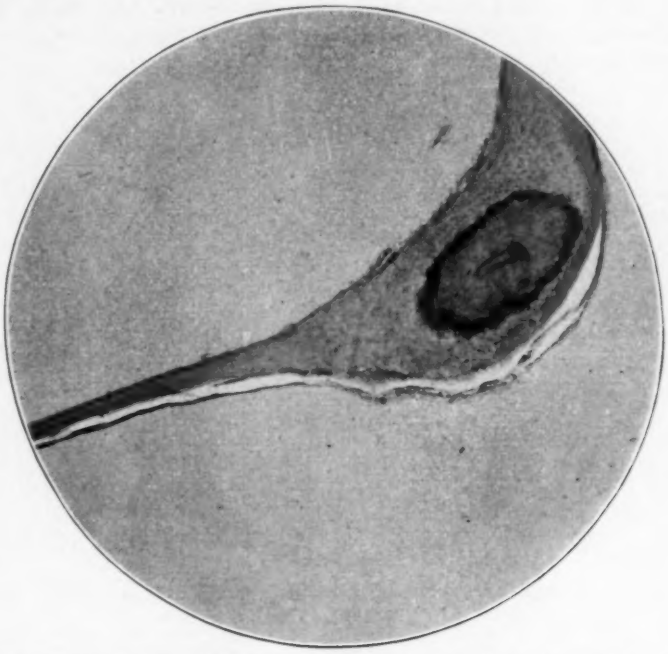

Fig. 1.—Photomicrograph of cross-section of a membrana tympani. Note the three layers of tissue: outer epidermoid, middle fibrous and inner mucous membrane. The outer epidermoid layer has been separated from the middle fibrous layer. The larger darkened central area is a cross-section through the long handle. This microscopic section was made from a membrana tympani removed from a cadaver. It is not a perfect normal histologic picture, as a small area of cellular infiltration can be noted just below the bony structure and beneath the epidermoid layer, where it involves the fibrous layer. The photomicrograph shows sufficiently well the location of the pathologic process in myringitis bullosa, that is, the area beneath the epidermoid layer, causing it to be separated from the middle fibrous layer.

REPORT OF CASES

Two cases of myringitis bullosa following influenza occurred in one family.

Case 1.—Mrs. S., aged 26, seen in consultation with Dr. Olin Holmes of San Mateo, Calif., had a mild case of influenza a few days before her admission

to the Mills Memorial Hospital because of excruciating pain in the right ear which had lasted for twelve hours. When I saw her, she was crying because of the pain in the ear. Her temperature was 103 F., and her pulse rate 100. She was suffering so severely that examination of the nose and throat was out of the question. Examination of the right ear showed a markedly bulging drum, without visible landmarks. With a Siegle otoscope, I found the appearance of the drum not that of acute otitis, but of myringitis bullosa (fig 2). This opinion was greatly strengthened by the determination, through tests with a watch and low tone forks, that she had no loss of hearing. A small superficial incision was made into the bleb, and a small amount of serous material was evacuated. The pain disappeared almost immediately. Recovery was complete in three days under treatment with phenol glycerin.

Fig. 2.—Photograph of a drawing showing the clinical pathologic picture of myringitis bullosa.

CASE 2.—Two days after I had treated Mrs. S., her husband, aged 30, consulted me with the identical history and pathologic picture that she had presented. I advised the same course of treatment, but as he objected to the incision of the bleb, 70 per cent alcohol with boric acid was prescribed. For three days he suffered great pain and his temperature remained at 101 F.; then gradually it subsided with the other clinical manifestations. His ultimate recovery was excellent.

I report these two cases as indicative of the possibility of a definite organism the toxins of which have a predilection for the drum membrane. That these two cases occurred in husband and wife may, of course, have been mere chance; yet I believe that the possibility of a definite infecting agent must be taken into consideration.

CONCLUSIONS

1. Myringitis bullosa is a definite clinical entity.

2. It is difficult to differentiate from the picture of the drum in acute otitis media.

3. The diagnosis depends on a close scrutiny of the drum membrane with a Siegle otoscope and on the lack of loss of hearing.

4. The cause may be a special organism or strain of organisms having a predilection for the membrana tympani.

5. Unusually high temperature and excruciating pain are predominating symptoms.

6. Myringitis bullosa usually accompanies an attack of influenza or is a sequel of that disease.

7. The treatment is either palliative, with drops, or a superficial incision into the bulla, incision through the membrane being avoided.

450 Sutter Street.

Clinical Notes

ACUTE FRONTAL SINUSITIS, ORBITAL CELLULITIS, OSTEOMYELITIS AND ABSCESS OF THE BRAIN, WITH RECOVERY *

CHARLES C. WOLCOTT, M.D., YONKERS, N. Y.

Abscess of the brain occurs most frequently in the temporosphenoidal lobe, secondary to otitic infection. The frontal lobe is the next most common location, and the nidus is usually in the frontal sinus.

Less than 180 cases of abscesses of the frontal lobe have been reported. The mortality rate has been about 75 per cent. In 1900, Denker [1] reported the first recovery from operation on an abscess of the frontal lobe. Recently, Skillern and Coates [2] reported a case in which recovery was complicated by osteomyelitis of the frontal bone.

Marked improvement in the surgical intervention for this condition has been made during the past few years, but the diagnosis offers much resistance to progress. Obviously, this is due to the so-called "silent area" that is involved.

Foster Kennedy [3] said that in the absence of etiologic factors pointing to a source from which the formation of an abscess could take origin, the diagnosis is almost impossible. An abscess will usually produce more drowsiness and hebetude but less papilledema than a tumor of the same size. Large encapsulated abscesses of the frontal lobe have been found at autopsy, which apparently had existed for years and yet had manifested insufficient symptoms to cause their detection.

The case to be reported did not offer particular difficulty in diagnosis, as it followed an acute osteomyelitic process of the frontal bone, and beside the usual slow pulse, subnormal temperature and marked hebetude there was bilateral papilledema of 4 diopters. One interesting phase was the repeated aspiration of the abscess with considerable cessation of symptoms. Following operation for the original conditions, seven aspirations were made, about 10 cc. of pus being removed each time, before the patient finally consented to further surgical intervention.

REPORT OF CASE

J. M., aged 26, a mail carrier, was first seen on Dec. 26, 1928, complaining of frontal headache of five days' duration. The right eye was completely closed, due to swelling of both lids, which had existed for two days. The temperature was 101 F.; the pulse rate, 120, and the respiratory rate, 22. Rhinoscopic examination showed a subacute rhinitis, but no free pus in either nostril. Roentgen examination revealed a right frontal sinusitis, but the other sinuses were normal.

* Submitted for publication, March 30, 1931.

1. Denker: Arch. f. Laryng. **10**:411, 1900.

2. Skillern, R. H., and Coates, G. M.: Ann. Otol., Rhin. & Laryng. **39**:398 (June) 1930.

3. Kennedy, Foster: Laryngoscope **39**:277 (May) 1929.

Operation was performed on December 27. The right frontal sinus was trephined, and the right orbit drained. Considerable pus was obtained from both places. Probing showed an erosion in the floor of the sinus but nowhere else. Bacteriologic examination showed Staphylococcus albus.

Steady improvement followed until Jan. 3, 1929, when the patient had a fit, fell out of bed and was unconscious for ten minutes. Drainage slowly subsided, and in nine days he was allowed to go home, having only a small fistula into the sinus. On the third visit to the office, drainage had completely subsided, and the dressings

Fig. 1.—Lateral view, showing the iodized oil within the sinus cavity.

were removed. The patient complained of some headache; he was told to report to the office every week, as further trouble was suspected.

Two weeks later he returned complaining of severe headaches. He had also vomited a few times. Examination showed subperiosteal edema and tenderness over the right frontal region, bilateral optic neuritis and exaggerated reflexes. He reentered the hospital, and roentgen examination showed an early osteomyelitic involvement. Operation was performed, and a spreading diploic infection involving a considerable amount of the right half of the frontal bone was revealed. Neither subdural granulations nor pus was found. After all the infected bone had been removed, an incision was made into the dura, and the subarachnoid space was packed with iodoform gauze. Twenty-four hours later, the gauze was removed

Fig. 2.—Anteroposterior view showing the iodized oil within the sinus cavity and the bony defect due to the surgical removal of infected bone.

Fig. 3.—Appearance of the patient one year after the final operation.

and the abscess located and drained. About 8 cc. of pus was evacuated. The cavity was small and extended posteriorly about 2 inches (5 cm.). Two rubber tubes were inserted. The patient's condition was satisfactory until six days later, when the infection in the bone showed signs of spreading. Another operation was performed, and 300 cc. of blood was given intravenously. Rapid improvement followed, and the tubes were shortened as the symptoms warranted. The optic neuritis rapidly disappeared. At the end of a month, the tubes were about ¾ inch (1.87 cm.) long. Then the patient had a restless night, and while he was asleep he removed all the dressings and both tubes. A fistula remained patent, and as very little discharge appeared the tubes were left out. This fistula was kept open for another month, and then was allowed to close.

On May 1, about two months after operation, the patient returned to work. I did not see him again until the first week in June, when he came to the office because of swelling over the frontal region which prevented his wearing the regulation mail-carrier's cap. He also complained of headaches, but said he thought that he could expect them after so much surgical intervention, and therefore had not consulted me sooner. Examination showed a large herniation through the bony defect, bilateral choked disks of 4 diopters and a general appearance of toxemia. He refused to enter the hospital again. In an endeavor to relieve the headaches, aspiration of the abscess was attempted and 10 cc. of pus obtained. The swelling and headache subsided, and the patient returned to work. This procedure was repeated six times during three weeks. Finally, the patient decided to reenter the hospital. Injections of iodized poppy seed oil 40 per cent delineated a well encapsulated cavity, which was opened and drained and permitted to obliterate itself by herniation.

On March, 1931, the patient was able to work daily and had no symptoms.

291 North Broadway.

AN IMPROVED BRONCHOSCOPE AND ESOPHAGOSCOPE*

SIDNEY ISRAEL, M.D., HOUSTON, TEXAS

The instruments presented for your consideration are the result of about ten years' experience in bronchoscopy and esophagoscopy, including work in city, county and private hospitals. During this period there has been no curtailment or lack of the necessary standard equipment of either American or European design, i.e., instruments made by Jackson, Bruenings and Kahler. Each of these instruments has particular features and claims to superiority, which may, or may not, appeal to the individual examiner.

The Jackson instruments require, first, that a U-shaped, distally illuminated laryngoscopic spatula be introduced in order to expose the larynx, often with no small degree of upward pull, or pressure, to overcome the resistance of the tongue and the tenseness of the muscles. The bronchoscopic tubes are inserted through the spatula; the spatula is then removed, the tubes being left in place. If for

* Submitted for publication, March 18, 1931.

* Presented at the Meeting of the American Bronchoscopic Society, May 27, 1930, and the American Laryngological, Rhinological and Otological Society, Atlantic City, N. J., May 27, 1930.

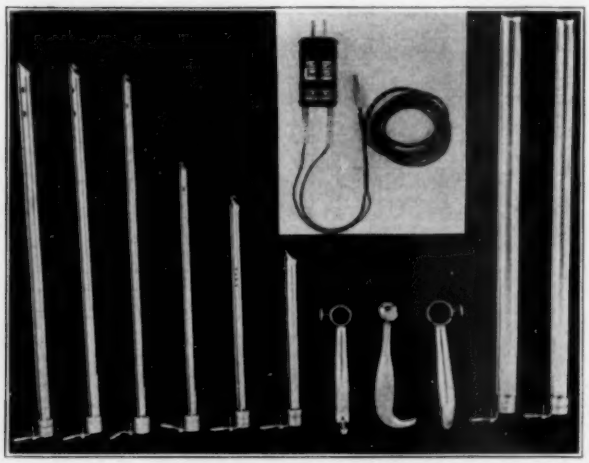

Fig. 1.—Complete working set, including bronchoscopic and esophagoscopic tubes, laryngeal spatula with light carriers, tube handles, transformer and connecting cord. (Any type of forceps, applicator or suction tube can be used through these instruments.)

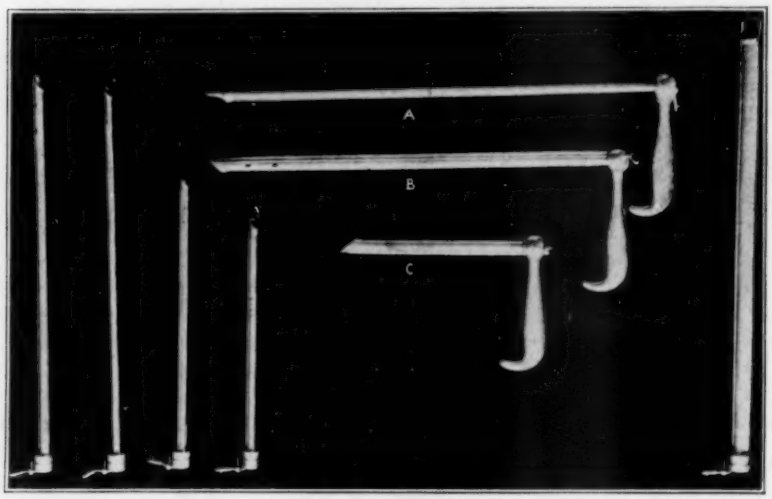

Fig. 2.—Bronchoscopic and esophagoscopic tubes with and without handles attached. *A* is the esophagoscopic tube with handle attached ready for introduction with the patient in the recumbent position, and with the light carrier in place, the distal end of the tube pointing upward; *B*, bronchoscopic tube with handle attached and light carrier in place, the distal end pointing upward for introduction with the patient in the recumbent position; *C*, laryngoscopic spatula with handle attached and light carrier in place, the distal end pointing downward for introduction with the patient in the upright position.

any reason it is desired to withdraw the tubes, this procedure must be repeated before their reintroduction can be accomplished. The tubes are made of soft brass and are easily dented or bent.

The Bruenings instruments have variously sized, reinforced brass tubes, which fit by means of a metal post into the electrically lighted handle, forming a U, with one portion, or arm, longer than the other, depending on the size of the tube

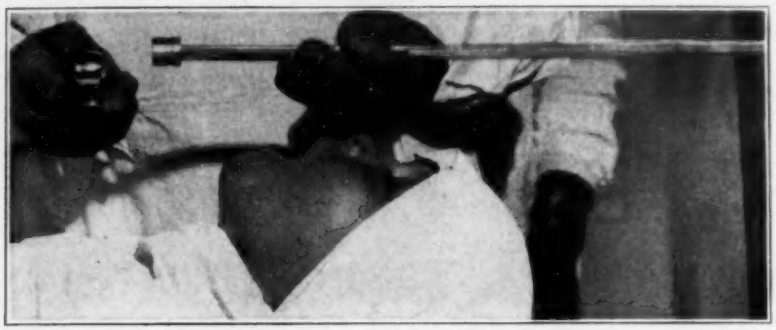

Fig. 3.—Bronchoscopic tube and handle about to be assembled and held in place by a thumb screw.

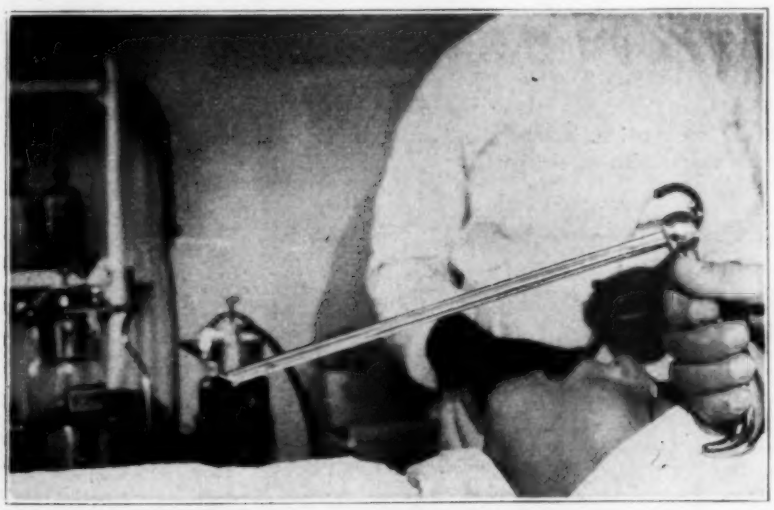

Fig. 4.—Handle in place on bronchoscopic tube.

selected. Owing to the fact that the Bruenings tubes are made of heavily reinforced brass, they will not bend and can be introduced directly into the larynx and beyond, or into the esophagus. Owing, however, to the fact that the Bruenings handle forms a U with the attached tubes when the instrument is ready for introduction, an upward lift is necessary to introduce the bronchoscope and to maintain it in position. The electric lighted handle is heavy, and since the illumination is in the handle, one is forced to work through a narrow slit.

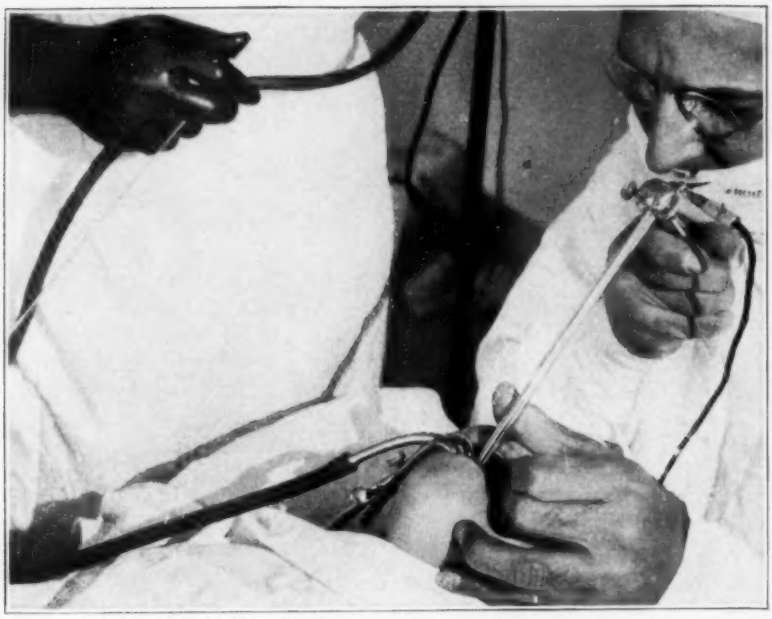

Fig. 5.—Insertion of the bronchoscopic tube is made by passing the distal end over the center of the tongue and pressing downward on the handle, which lifts the tongue up, thereby exposing the epiglottis. The tip of the epiglottis is then lifted upward by means of the tip of the bronchoscopic tube through downward pressure on the handle, and the instrument is then moved gently forward for further observation of the parts.

Fig. 6.—Instrument fully introduced.

Kahler devised his instruments to overcome some of these shortcomings. First, he incorporated an adjustable handle, and by so doing enabled the operator to introduce the tubes more easily when the patient is in the recumbent position, because one can press down on the handle, causing the tube to lift the tongue upward until the epiglottis is reached, when further introduction can be accomplished. No pulling or lifting upward is necessary during any stage of the examination or reintroduction of the tubes. The tubes are of heavy brass and are inserted into the handle. The handle is also heavy, and therefore clumsy. The illumination in the handle is not so good as in the Breunings instruments, and is a source of annoyance to some, owing to the objectionable reflection thrown into the operator's eyes.

The bronchoscopic and esophagoscopic instruments that I present consist of rustless metal tubes of various sizes, which are distally illuminated. They cannot be dented by the patient's teeth and will not bend (figs. 1 and 2). These rustless metal tubes are quickly inserted and locked into a convenient handle (fig. 3), which attaches at right angles to the tubes, is just large enough to afford a firm grip and is light in weight (fig. 4). The handle is made so that it fits tubes of all sizes and can quickly be changed from one tube to another. The handle permits the tubes to be placed in any position with relation to the tip or distal end, depending on whether the instruments are to be introduced with the patient in the recumbent or in the upright position. They are introduced directly without the aid of accessory equipment. This represents the complete assembly.

Introduction is promptly accomplished by grasping the handle, which is at right angles to the attached tubes (fig. 4), and by passing the distal end of the tube over the center of the tongue (fig. 5), which is held upward out of the way by downward pressure on the handle, in order to allow the epiglottis to be recognized, or engaged, for exposure of the larynx and the passages beyond. The tubes will not bend, and there is none of the tiring strain of lifting or pulling upward that is necessary when other models of instruments are used. During the past two years, these instruments have been used for patients of all ages and in all types of cases, both bronchoscopic and esophageal.

In presenting these improved bronchoscopic and esophagoscopic instruments, I am reminded that nothing can remain static; well enough can never be let alone. I have endeavored to incorporate the best features of all the other types of instruments and to eliminate the objectionable ones, making possible easier and more rapid introduction and keeping in mind the great value of simplicity.

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TECHNIC OF CORRECTING NASAL DEFORMITIES*

EDWARD KING, M.D., CINCINNATI

The structure of the nose consists of bone and cartilage. The bony part is made up of the nasal bones, the ascending processes of the superior maxillae and the perpendicular plate of the ethmoid and the vomer. The cartilaginous portion, which is the principal support of the tip of the nose, is formed by the quadrangular cartilage that fits into the vomer and the perpendicular plate of the ethmoid. It

* Submitted for publication, Feb. 28, 1931.

has a free edge at the lower portion, where it fits into the columella. The triangular cartilages are placed just below the nasal bones and extend downward almost to the alar cartilages. The small space that occurs between the triangular and alar cartilages is the weak spot in the dorsum of the nose. It is at this point that the depression occurs when too much of the septum is resected, as here the septal cartilage alone is responsible for support of the dorsum. The alar cartilages form the tip of the nose. On their inner surface is a small thin projection which joins the septal cartilage in forming the columella. The cartilages do not, however, offer any support to the nasal tip. The combination of bone and cartilage make up the structure of the nose, and it is with this combination that one deals constantly in attempting to perform corrective surgical measures. One must keep this in mind if the best results are to be obtained; otherwise one's efforts will be fruitless.

An example of the need for careful consideration of this combination is found in old fractures, wherein a greatly deviated septum is seen. No matter how well

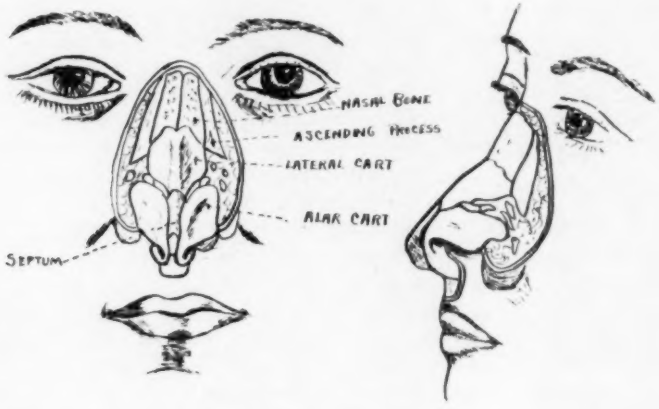

Fig. 1.—Front and lateral views of the nose showing the bones and cartilages. (After Schaefer.)

the operation on the bone is done and the nose approximated, the surgeon is doomed to defeat if he neglects the septal cartilage. It must be corrected along with the fractured bones, or the nose will slip from its adjusted position.

The technic of the various procedures is dependent on these principles. One of the common deformities is a hump on the nose. The hump may be confined to the nasal bones or to the cartilage, but as a rule there is an involvement of both. Various authors have devised methods of correcting this deformity. Kolle and Beck employed the external route by an incision on the external surface of the nose, exposing the part to direct vision. Because of a desire to avoid infection by transnasal routes, Monk devised the columella incision. This technic is employed by some surgeons exclusively. The simplest method is through an incision far forward in the vestibule. The knife is carried toward the hump, separating the tissues for a short distance above and on either side of the deformity. Following this, a blunt elevator is used for dissection of the skin and subcutaneous tissues over the same area, enlarging the space so that there is room for the insertion and operation of the saw. A small, sharp elevator is then employed for lifting the periosteum. The saw is inserted and placed in position. An estimate of

the amount to be removed must be made, and it is always advisable to leave the lower one-third for rasping rather than to risk sawing off more than is indicated. It is also essential to keep the saw in the proper plane during its manipulation. When the sawing is completed, fragments of bone and cartilage must be removed, the rasp being used for rounding out and smoothing down the remnants of the lump. The removal of the lump often leaves a broad, flat surface which would be unsatisfactory to the patient if uncorrected. In these cases it is necessary to narrow the nose by fracturing the nasal bones and pushing them into the midline. This may be accomplished by sawing through the nasal bones at their attachment to the superior maxilla.

During the operation it is important to maintain constant pressure over the dissected area to control bleeding; immediately after the operation a piece of malleable lead sheeting is fitted to the nose and kept in place for twenty-four hours to control subcutaneous bleeding. It is not necessary to suture or to employ packing.

A nose with a hump is commonly a long nose, and when the hump is removed, the length is exaggerated. To shorten the nose, the alae are retracted, and an

Fig. 2.—Incision in the vestibule.

incision is made transversely through the septum. A small knife such as a Graefe knife is used. The incision is made through mucous membrane and cartilage on both sides. A triangular piece of cartilage and mucous membrane, and sometimes a part of the skin at the lower border, is excised. The apex of the triangle is directed toward the nasal spine. The size of the section must depend on the amount of shortening desired. Sutures are then placed in the incision, uniting the skin and the mucous membrane on each side. If the sutures are placed diagonally, lifting of the tip is accomplished.

Attention has been directed to the great increase of motor accidents and the resulting facial injuries. It is important in these cases to give special consideration to the nose in order to prevent the deformities and obstructions which necessitate surgical corrections at a later date. If the proper care and treatment were given these patients at the time of the injury or shortly thereafter, there would be no call for surgical procedures later. The rhinologist should be called on to take care of cases in which there is any evidence of injury to the nose or in which there is a suspicion of injury. Roentgenograms will not suffice to rule out the presence of fractures and dislocations. Immediately following the injury there are swelling and subcutaneous hemorrhage, so that thorough examination and treatment are not possible. When the swelling goes down (as it does in three or four days), the nose should be examined both internally and externally. The septum

is often dislocated when fracture and dislocation of the nasal bones occur or, as is frequently the case, a fracture and dislocation of the ascending processes of the superior maxillae.

Some operators believe in manipulating the injured parts immediately after the injury. It is my practice, however, to wait until the swelling has subsided, when a better estimate of the amount of damage can be made, and then to do whatever is indicated. General anesthesia should be employed at this time. The septum should receive attention first. If it is dislocated, the rubber covered Asch forceps can be used to grasp it and lift it forward and upward into the midline. The same forceps is used to grasp the bony parts, with one blade outside and one inside the nose. Maintaining the injured parts in the proper position is difficult. Some surgeons use packing in the nose and a splint externally to accomplish this. Packing of the nose for any length of time is objectionable and should be avoided. It is possible to keep the parts in the midline by adhesive straps applied immediately after the operation and an external splint applied a few days later.

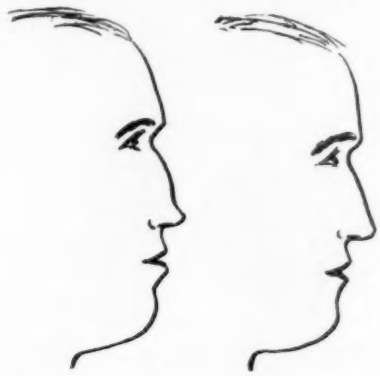

Fig. 3.—Depression following submucous resection.

As a rule, the old fracture is accompanied by a dislocation of the septal cartilage. It is necessary to correct the septum before attempting the mobilization of the nose; otherwise the septum will not allow sufficient freedom. The septal resection may be performed at a previous date or at the time of the refracture. In order to mobilize the parts, the ascending processes of the superior maxillae must be severed, together with the attachment to the frontal bone. This can be done with a chisel inserted through a small external incision in accordance with the method of Marshall, or through an incision through the vestibule, the chisel being used to sever the ascending process without perforating the mucous membrane. Joseph's method seems simpler.

The technic of refracture is accomplished in the following way: An incision is made in the vestibule; the skin and subcutaneous tissues are elevated as high as the angle of the orbit. It is not necessary to elevate over the front of the nose unless some correction is contemplated in that area. After elevating the periosteum with a sharp elevator, a saw is employed to sever the ascending process of the superior maxilla. This procedure is the same on both sides. The attachment of the nasal to the frontal bones must now be separated by means of a long, curved chisel, which is inserted through the same incision. The nose should now be freely movable, but if some small fragment of bone is still attached, a few

light blows of a hammer with a felt-padded block held against the side of the nose will complete the mobilization. The position may then be adopted that is calculated to give the best result. The nose is covered with malleable lead sheeting. If bleeding is profuse, a small piece of packing is placed in the vestibule on both sides. When the swelling and soreness subside in three or four days, it is

Fig. 4.—Saw in place for removal of the hump.

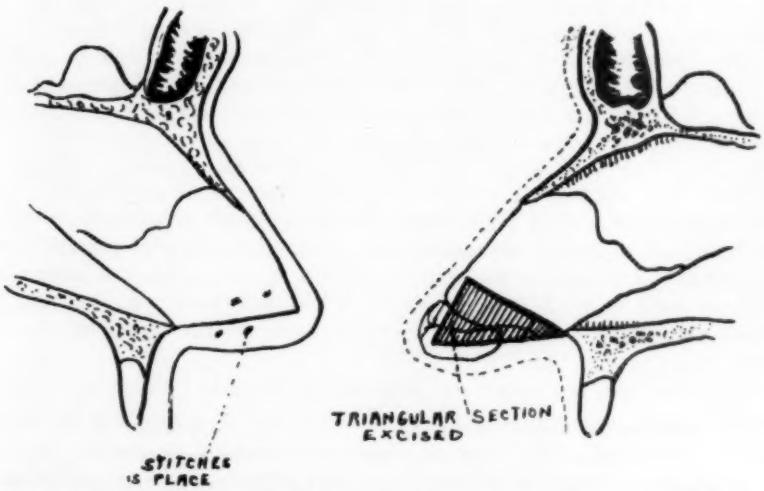

Fig. 5.—A triangular section is removed in shortening. The stitches are placed at an angle to lift the tip. (After Joseph.)

necessary to use a splint to keep the nose in the new position. As a rule, the refractured nose has a tendency to slip back into its old position unless some method of splinting is devised to keep it in its new place for a week or ten days.

In a case of saddle nose the deformity offers a greater problem, because some material must be supplied to make up for the deficiency over the bridge. It is

almost universally conceded that rib cartilage is the most satisfactory substance for filling this defect. The advantages of rib over all other substances lie in its resistance to infection and the fact that it is not absorbed.

I will not go into the technic of removing rib cartilage, for that will be found in any good textbook on surgery. In removing rib, take enough for two implants, a full thickness if possible, and bury the extra implant in a special bed of its own and not in the incision used in removing the rib, for this incision may become infected and the implant may be lost. It is wise to inform patients of this precaution, because most of them will not submit to a second resection of the rib.

Great care must be exercised in handling the implant after its removal. The nurse must be instructed to guard it carefully in a warm salt bath, and in picking it up for insertion a tenaculum forceps should be used to prevent dropping.

In preparing the bed for the implant, one must keep in mind the danger of infection. While the route through the vestibule is the easiest, it is not always the safest. If any infection is present in the nose, the rib must be inserted through an incision in the columella or the eyebrow. The skin and subcutaneous tissues are elevated over the bridge of the nose. A rasp is employed to make a raw surface for the implant. The rib is trimmed to its proper size and inserted into its bed. If it does not fit, its immediate removal and more trimming are indicated until the proper result is accomplished. The incision is closed carefully, and a piece of malleable lead sheeting is used to hold the implant firmly and to prevent bleeding. Beware of making the bed for the implant too wide, for the rib will readily slip from side to side. Trim the point of the rib well so that it fits far down in a pocket just above the alar cartilages. This pocket will aid in maintaining the proper position. Subcutaneous hemorrhage must be guarded against.

If rib cartilage is unavailable or if it fails, the next best material is ivory. This has been used extensively by some operators. Malianak published an extensive report on the comparative value of ivory with other implants. It will remain in place securely over a long period. If infection occurs it must be removed, otherwise it is highly satisfactory. The ivory can be fitted with precision to the depression by using a plaster cast model and rubber modeling material previous to operation. If a model is made carefully, the ivory can be slipped into its bed with great facility. The bed for ivory must be prepared through an external incision. This is done in the same way as described for the rib implant, and the same precautions must be taken for its after-care. I am sure that ivory will be used more and more as experience with it grows. Apparently its greatest fault is that it must be removed in the presence of infection, although that objection holds good in many cases of transplantation of ribs and bones. At any rate, the utmost care must be observed in the use of any of the transplants to avoid infection.

SUMMARY

The problem discussed concerns some of the common deformities met with in practice. There are many other types much more difficult to correct. However, the principles are based on a sound knowledge of the anatomy, thorough asepsis and good surgical technic. The surgeon must take into account the general physiognomy of the patient before adopting any corrective procedure.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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ACUTE AND CHRONIC OTITIS MEDIA AND SINUS THROMBOSIS *

SAMUEL J. KOPETZKY, M.D.
NEW YORK

In reviewing the literature on the topic assigned to me, I was struck with the difference in the type of papers published in different countries. Italians, Spaniards, Frenchmen and many of our own essayists are writing clinical papers mostly. Basic topics, the principles of which are accepted by scientific otologists, are the subjects under discussion by the German writers; fine points in the elucidation of these principles and the reasons underlying them are being worked out, with a resultant clearer understanding of them.

The Wittmaack school of thought on the theory and evolution of middle ear diseases is receiving considerable attention. There is hardly an issue of any German or other European periodical that does not take up some phase of the Wittmaack work. Wittmaack has revived considerable interest in the basic problems of acute and chronic suppuration, and those who have acquainted themselves with his work and with his interpretations of the genesis of ear infection will be impressed with the soundness of his arguments and will realize how he has clarified certain heretofore unexplained phenomena of aural purulencies. On the whole, a survey of the various articles published seems to corroborate Wittmaack's work.

BASIC WORK

The von Schilling work in the field of hematology in otology has become an accepted addition to the diagnostic armamentarium. Weiss, in our country, reported on the application of this method of "blood counting" to otologic problems and stimulated many other observers to report their findings. Great emphasis has heretofore been placed on the estimation of the percentage of immature forms of polymorphonuclear leukocytes, commonly called staff cells; the prognosis is adverse when there is a shift "to the left" and, conversely, good when there appears a

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shift "to the right." Judd [1] made a particular study of the rôle of the eosinophil in otologic conditions. He found that at the beginning of acute purulent otitis media there is a "septic factor," namely, the rise in leukocytosis. An increased percentage of neutrophils and an equally marked decrease in the percentage of eosinophils occur when this septic factor is in force. When purulent mastoiditis supervenes there then appears a "lytic factor," i. e., a rise in the percentage of eosinophils to normal or slightly more than normal. A further complication is accompanied by a still further increase in leukocytosis with a sudden drop in the eosinophils. This observation is definitely useful when taken in connection with the von Schilling count. My own experience, as well as that of others, shows that the latter method of blood counting is of more prognostic than diagnostic significance. Judd's observation definitely tends to increase the diagnostic value of the von Schilling count.

For a long time studies of the bacteriologic flora in middle ear suppurations have been of interest to otologists, and one would have supposed that the possibility of drawing new conclusions from such studies would have been exhausted by this time. There is now a correlation of bacteriologic studies with clinical findings, particularly in relation to acute middle ear suppurations. Bonnahon [2] found that the streptococcus group of organisms attacks the middle ear at all ages of life, that this group produces a severe clinical picture with high fever, and that there result, from the invasion of the middle ear structures by the streptococcus group, pathologic changes that produce marked destruction of the bone but not necessarily much pus formation. The pneumococcus, which is one of the streptococcus group, seems to attack young children mostly. The aural disease that it causes results in few generalized symptoms. In other words, it seems to arouse little systemic reaction. A general sepsis rarely occurs with the ear as a focus and the pneumococcus as the invading organism. However, in contradistinction to other members of the streptococcus group, there is marked purulency present. Ordinarily the prognosis for recovery is good. The pneumococcus type III (*Streptococcus mucosus-capsulatus*), Bonnahon believes, attacks only old or very enfeebled persons; and in these, although few general symptoms are produced, there is present a marked destruction of bone—a necrotic osteitis. Hadjopoulos,[3] on the other hand, studied the specific etiology of invading organisms and, in a study confined to the streptococcus group, has made some interesting observations. He concerned himself

1. Judd, C. C. W.: The Rôle of the Eosinophile in Certain Otological Conditions, Laryngoscope **40**:203, 1930.

2. Bonnahon, J.: Contribution à l'étude bactériologique des suppurations auriculaires à microbes pyogènes aerobes, Arch. internat. de laryng. **9**:897, 1930.

3. Hadjopoulos, L. G.: Bacteriological Differentiation and Specific Etiology of Mastoiditis, Ann. Otol., Rhin. & Laryng. **39**:1017, 1930.

with the specificity of the invading organism and particularized on the etiologic relationship of various types of subcultures to the clinical course. It is a striking fact that definite types gave similar findings in most instances. I have been privileged to observe this work and to check the findings, and I consider Hadjopoulos' observation a distinct advance in basic studies. To comprehend his work, a sketch of its scope is necessary. In the first place, he considers purulent otitis media as a primary lesion and the mastoid invasion as a complication occurring in the course of a generalized infection. The relationship of the otitis media to the mastoiditis is essentially anatomic, the true origin of the infection being the mucosa of the upper respiratory tract. In a study of ninety-one cases of mastoiditis, he cultured the pus obtained from the mastoid process at the time of operation. The streptococci found were first studied to determine their hemolytic qualities. Subcultures were made and the findings classified according to their fermentation of sugars of the Holman classification. Streptococcic flora of the nasopharynx can be classified, according to Hadjopoulos, into the following divisions: (1) obligatory aerobes (*Streptococcus salivarius* and *anginosus*); (2) facultative aerobes (*Streptococcus pyogenes* and *mitis*), and (3) facultative anaerobes (*Streptococcus infrequens* and *faecalis*).

The Obligatory Aerobes.—Owing to their absolute dependence on a free supply of oxygen, the pathogenicity of the obligatory aerobes (*anginosus,* mainly) is limited to the exposed mucosa of the upper alimentary and respiratory tracts. The inflammation is invariably of the acute catarrhal, congestive or granular, and at times even of the hemorrhagic and necrotic, types. If the initial inflammation does not subside naturally within a week or ten days, the chances of its spread to the middle ear through the eustachian tube increase. In its new environment, in all respects similar to the original focus, the inflammation for a short time runs the typical course of acute catarrhal otitis media, manifested by a turgent, red and slightly bulging tympanic membrane accompanied by moderate pain. The inflammatory products are naturally of the acute catarrhal type, i. e., a mucoserosanguineous fluid of moderate amount. In the meantime, certain changes occur that alter this natural course. That of prime importance is the closure of the eustachian tube due to inflammatory edema. The whole cavity, originally an open one with sufficient oxygen, now becomes temporarily closed with a complete limitation of the oxygen supply to osmosis through the hemoglobin of the turgent mucosa and serosanguineous exudate. Thereafter there is an accumulation of the exudate with more pressure and therefore some pain and more bulging of the drumhead. If there were no surgical intervention, the outcome of the case would depend entirely on the degree of accumulated immunity. When such is sufficient, it is aided further by a gradual exhaustion of the oxygen supply which renders the cavity less adapted to the needs of

the invading host, thus leading to a temporary or even a permanent recession of the inflammation and the recovery of the patient. Usually, however, there occurs a spontaneous rupture of the drum-membrane, with the release of pressure and hence an abatement of pain, lowering of temperature and, in fact, signs tending to point toward recovery unless a clogging of the artificial opening takes place. Now there ensues the second phase of the disease, which usually brings the patient to hospitalization and eventually to surgical intervention.

At the time that a discharge of the exudate into the external auditory meatus takes place, the streptococcus acquires new virulence from its access to a fresh supply of oxygen. Due to external contaminants, the discharge becomes very purulent, it rapidly fills the tympanic cavity, seeps into the antrum and infects the mastoid process with its mass of interconnected cells. According to Hadjopoulos, the complication now occurs and a new train of symptomatology develops: gradual rise of temperature, seropurulent discharge from the ear and definite postauricular tenderness. In the mastoid process the cellular structure at this time becomes devoid of air and partly devitalized; it undergoes hemorrhagic-necrotic change. Its air spaces become filled with a moderate amount of thinly purulent, serosanguineous exudate until eventually the mastoid process remains only a sack of necrotic tissue, still preserving the cell outlines with their trabeculae in places. Surgical intervention is usually reached at about this stage, with invariably successful results. There is practically no mortality in Hadjopoulos' obligatory aerobic streptococcus type of infection.

In case of delayed surgical intervention, with this same organism, the necrotic process may extend to the immediate neighborhood, giving rise to cortical perforation, proliferation of the sinus wall, erosions of the dural and sinus plate and sometimes transient septicemia. In the very young child, when the formation of the antrum and cellularization of the mastoid are as yet incomplete, this type of infection runs a continuous course involving both middle ear and mastoid processes almost simultaneously, and a cortical perforation with a subperiosteal abscess usually results. Even with complicating lesions present, surgical treatment is usually successful.

The Facultative Aerobes.—This very important and highly pathogenic group, because of its well defined biologic characteristics, is different in terms of clinical symptomatology from the *anginosus salivarius*—the obligatory aerobe previously described. This group, in its oxygen requirements, is facultatively aerobic and is capable of surviving under abnormally low oxygen tensions. Its metabolic requirements are derived from fermentation of simple carbohydrates as well as the splitting of complex proteins. Unlike the *anginosus* group, when implanted on otherwise healthy mucous membranes these organisms penetrate deeply

into the structures and locate in the submucosa and stroma in close proximity to the lymphatic, vascular and nervous plexuses. Thus located, by means of their positive chemotaxis, they excite an active leukocytosis, which results in painful, deep-seated infections requiring surgical intervention.

Usually the production of sufficient local immunity on the part of the host aborts their further spread. Half-way measures, on the other hand, seem to increase their virulence and favor the invasion of the lymphatics.

The involvement of the middle ear and the mastoid process by this group of organisms is generally traceable to a pyogenic infection of the nasopharynx. The spread of this nasopharyngeal infection is not limited by the continuity of the lining mucosa as in the *anginosus* type, but follows the course of the lymphatics and the blood stream. Thus, such areas as the jugular bulb may become involved, causing a jugular bulb thrombosis, without the existence of a well developed otitis or mastoiditis, although in the majority of cases a purulent otitis is present.

The nature of the infection produced by this organism has been found to be strictly pyogenic, accompanied by high leukocytosis. The onset of the disease is characterized by a sudden, intense, throbbing earache, an intermittent fever, notably of the septic type, and a gradual accumulation of the purulent exudate in the middle ear. On account of the steadily increasing pressure and the accumulation of the proteolytic enzymes of leukocytes, as well as of the inciting micro-organisms, a spontaneous rupture of the drum-membrane usually occurs before the family physician is called. An otoscopy before the rupture would reveal a white, distended tympanum, puncture of which would give rise to a profuse, thick and purulent discharge. Whether the rupture is spontaneous or by paracentesis, it is usually followed by considerable relief from the majority of symptoms. Nevertheless, the mastoid process is invariably involved. Eventually the air cells are all broken down, and a markedly septic turn ensues in the course of the disease, necessitating hospitalization.

The postoperative findings demonstrate the far-reaching destructive potentialities of this highly pathogenic group of micro-organisms. The type of complications involves an area much wider than that of the middle ear and mastoid process proper, and includes not only the usual complications of mastoiditis but remote metastatic lesions in muscle sheaths and bone marrow. A further unfortunate feature of this type of mastoid infection is its association with chronic debilitating diseases, such as diabetes, myocarditis and endocarditis, bronchopneumonia and erysipelas.

The Facultative Anaerobes.—The natural habitat of these streptococci is the human intestinal tract. Under normal circumstances they represent 85 per cent of the fecal streptococcic flora. When pathologically inclined, they usually give rise to chronic inflammations. Although by nature anaerobic, they can live and still preserve their pathogenicity under strictly aerobic conditions.

In the upper respiratory and alimentary tracts they can be isolated from such partly or totally closed and chronically infected foci as the gums, dental caries, tooth roots, nasal accessory sinuses, etc. Some of these biologic characteristics were witnessed in the records of cases studied: four of six patients were chronic sufferers from a previous otitis or mastoid infection in association with a still active paranasal sinusitis.

In particular, the course of infection is usually protracted, occurring in children under 10 years of age and giving rise to a moderately septic temperature. The complications are in the nature of chronic infections with granulation tissue covering the affected areas. There was no fatality reported in this group.

Of the ninety-one cases studied by Hadjopoulos, twenty-one showed a streptococcus of the obligatory aerobic group. All of the patients recovered. Seven had a streptococcus of the facultative anaerobic group as the infecting organism. All of these recovered also. Fifty-eight cases, or 64 per cent of those studied, were caused by the facultative aerobic group, namely, *Streptococcus pyogenes* or *mitis,* the former being present in fifty-four of the cases. Of this group, twenty cases were fatal.

I have repeatedly stressed the isolation of the invading organism in these surveys. The correlation of pathologic findings with a given organism, as done by Bonnahon, again points to this as a valuable aid to prognosis and the proper estimation of a given case. The work of Hadjopoulos emphasizes still further the value of studies of the invading organisms, including their subcultures. His very definite correlation of these subcultures with the clinical picture gives data of great value in estimating a given case and furnishes a clue as to the probable course the complication will run.

German [4] studied the phenomena exhibited during an epidemic of acute purulent otitis media with reference to the clinical picture presented. He studied the pus in all cases that showed *Bacillus mucosus-capsulatus* (Friedländer's bacillus). These cases started with severe pain in the ear, very high fever on the first day and then a sudden drop to normal, which level was retained. The otoscopic picture

4. German, T.: Friedländer-Otitis als typische und epidemische Erkrankung, Monatschr. f. Ohrenh. **64**:1050, 1930.

resembled that of a mucosus otitis with the rapid advent of a perforation of the drum before paracentesis was clinically indicated. In all cases the external auditory canal was concentrically narrowed. This epidemic of otitis was characterized by the mildness of the lesion and the freedom from complications. In many of his cases there was found in culture *Bacillus pyocyaneus* in symbiosis with the Friedländer's bacillus.

Hanse [5] made roentgenologic studies in 500 cases of acute purulent otitis media in order to determine the influence of pneumatization of the mastoid process on the course of an aural suppuration. He found that in 495 of the cases a well pneumatized mastoid process was present. In the other cases there was absence of cells on both the diseased and the opposite sides, but there was evidence of prior suppuration; the patient had had scarlet fever in infancy. Hanse concluded that a sclerotic mastoid is rarely associated with acute purulent otitis media, that normal pneumatization favors an acute lesion and that poor or absent pneumatization results in chronic suppuration. This is in virtual accord with Wittmaack's findings. It seems timely to revise the conception that sclerotic mastoids are the result of chronic middle ear disease rather than of faulty pneumatization in infancy. If one maintained the belief that sclerosis of a mastoid process ensues as a result of chronic middle ear suppuration, one should expect a whole train of pathologic proof of the developmental steps through which this process of eburnation went before it presented itself as the finished, sclerosed mastoid process. This pathologic proof is, up to now, lacking. Intermediate lesions of advancing sclerosis and of partially pneumatized mastoid processes associated with chronic lesions in the middle ear have never been demonstrated to the satisfaction of the bone pathologist. Clinically, both the dangerous and the nondangerous types of chronic aural suppuration may show sclerosis of the mastoid process. One is a lesion confined to the tympanic mucosa; the other is a lesion involving bone. The whole proposition might be stated conversely; namely, that it is extremely doubtful, in view of Wittmaack's work, whether an acute mastoidal lesion can occur in a nonpneumatized mastoid process, and that all lesions occurring in nonpneumatized mastoids should be considered as chronic in nature irrespective of their duration in time.

Marx [6] disagreed with Wittmaack's belief that various types of infantile otitis not only interfere with normal pneumatization but leave their mark in the tympanic cavity which later can be identified as the result of otitis media neonatorum catarrhalis or purulenta. Marx

5. Hanse, W.: Akute Mittelohrentzündung und Pneumatisation des Wartzenfortsatzes, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:424 (Feb. 24) 1930.

6. Marx, H.: Zur Frage der Bedeutung der Mittelohrentzündung des frühesten Kindesalters für später, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **126**:71, 1930.

feels that typical changes resulting from infantile otitis can also be brought on by otitis occurring later in life. Directly in opposition to this, Crowe and Polvogt [7] reported finding embryonal tissue in the vicinity of the round window, the epitympanic space and the antrum in two autopsies on persons 63 and 53 years of age, respectively. It is conceded that inflammation of the middle ear will leave scarification; but those inflammations that occur in early life, according to Wittmaack, definitely interfere with the normal pneumatization of the middle ear and mastoid process besides producing changes in the character of the tympanic mucosa. Consequently, it should be simple to determine the type of changes found, from the study of the type of tympanomastoid present. It hardly seems logical to assume that embryonic tissue, as reported by Crowe and Polvogt, is the result of an infection occurring during adult life with a reversion of adult mucosa to its primitive form. It seems reasonable to assume that the finding of such embryonal tissue by both Crowe and Polvogt is evidence of its retention from the early days of life. From a purely pathologic standpoint, the reversion of well organized tissue to one of embryonal type, owing to suppuration late in life, has never been proved.

CHOLESTEATOMA

The pathogenesis of cholesteatoma is still controversial. In the discussion of this subject, it is at all times assumed that the literature deals only with the so-called secondary cholesteatomatous tumors of the ear and not with the true congenital cholesteatoma.

Lautenschläger [8] conceived an interesting theory in regard to the genesis of cholesteatoma. He feels that since the epidermis is a protective membrane when normally functioning, when it is present in the middle ear it acts as a foreign body. In addition, since the ingrowing epidermis is nourished only by intercellular fluid, this poor nutrition renders it incapable of excessive growth at the expense of other more richly nourished tissue. Consequently, the ingrowing epidermis is soon subjected to the fate of a foreign body and is encapsulated. If this encapsulation is incomplete, the products of desquamation find a way out into the canal and the epidermis spreads itself flatly on the surrounding walls. On the other hand, if the encapsulation is complete, a tumor forms and a characteristic cholesteatoma is present. Lautenschläger believes that the growth of this tumor mass is not due so much to the pressure of an increasing accumulation of epithelial débris as it is to the activity of the lipoidal products of the cholesteatoma which destroys the surrounding bone and allows growth.

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7. Crowe, S. J., and Polvogt, L. M.: Embryonic Tissue in the Middle Ear and Mastoid: Report of Two Cases, Arch. Otolaryng. **12**:151 (Aug.) 1930.

8. Lautenschläger, A.: Zur Genese und Morphologie des Cholesteatoms, Klin. Wchnschr. **9**:599 (March 29) 1930.

Retjo,[9] taking Lautenschläger's work as a basis for his observation, likewise holds that the destructive property of a cholesteatoma is not dependent on mechanical pressure but on the lipoidal content of the tumor that attacks the bone. He feels that moisture enhances this activity.

Mayer[10] discussed three theories of the origin of cholesteatoma situated in the attic. The first is the blind sac intrusion of the membrana flaccida following tubal closure. He discards this theory. The second is that it is an active ingrowth of epidermis as a result of active proliferation. The third is that an ingrowth of epidermis follows the subsidence of an acute purulent otitis media with its perforation in Shrapnell's membrane as a result of inflammation.

Histologic studies of the formation of cholesteatoma have convinced Döderlein[11] that the epidermis gains entry into the middle ear in one of two ways, and that the time of the ingrowth will decide whether or not a tumor mass will develop. During the presence of an inflammation in the middle ear, epidermal cells may find their way into the tympanic cavity and spread on the tissues which have begun to change because of the inflammatory reaction that is present. Tumor formation will not usually develop in such cases since the epidermis is resorbed in the process of healing. At the termination of an inflammatory process an ingrowth of epidermis will continue to spread and will not be absorbed. Döderlein believes that the latter is the genesis of the formation of cholesteatomatous tumors.

It is interesting, in regard to cholesteatoma, to review the work of Fischer,[12] who attempted to draw an analogy between aural cholesteatoma and skin cancer. There is, however, little evidence to support this point of view. Epidermis is definitely a foreign epithelium in the middle ear. Exactly why it should grow into the tympanum is the real problem that is still open for solution. It is reasonable to suppose that all middle ear suppurations would, in the course of time, heal in the usual manner, namely, by connective tissue formation. As a matter of observation, however, often this does not occur. What follows in the train of these otorrheas is observed to be another lesion, which has been designated "cholesteatoma." The most reasonable explanation of this phenomenon of the ingrowth of epidermis seems to be that of

9. Retjo, A.: Du cholestéatome. Des principes nouveaux dans la thérapeutique du cholestéatome. Des expériences pour démontrer le cholestéatome par une voie chimique, Rev. de laryng. **51**:522, 1930.

10. Mayer, O.: Die Entstehung des Attikcholesteatoms, Acta oto-laryng. **14**: 242, 1930.

11. Döderlein, W.: Histologische Studien über Cholesteatombildung, Ztschr. f. Hals-, Nasen- u. Ohrenh. **26**:521, 1930.

12. Fischer, J.: Analogy Between Cholesteatoma and Skin Cancer, Laryngoscope **40**:440, 1930.

Wittmaack.[13] He views the process as one of attempted repair on the part of nature. A degenerated mucous membrane in the middle ear is replaced by healthy squamous epithelium growing from the external auditory canal. The fact that it invades the middle ear in some cases and not in others is due to certain factors that predispose to the development of such an invasion. This predisposition and the severity of the acute lesion in the middle ear are the actual factors. When the middle ear lesion is of the acute necrotic type, such as is seen in scarlet fever, the mass necrosis of middle ear tissue results in a large perforation of the drum which often borders on the bony tympanic annulus. When, in addition, there is a hyperplastic mucosa as the result of otitis media neonatorum catarrhalis, there are then present the factors favorable to the ingrowth of epidermis. Hence, as the bacterial infection subsides, the ingrowing epidermis spreads at the expense of the mucosa. In the latter state the otorrhea is not the result of bacterial infection, but of the continued irritation of two foreign types of epithelium brought into juxtaposition in the middle ear. When this process continues for any length of time, as it usually does, one can observe clinically the gradual replacement of the mucosa by shiny epidermis which soon covers the tympanic walls. Recently, Almour,[14] in an article on the rôle of the squamous epithelium in the repair of middle ear suppurations, brought out this fact: When there is a large space in the attic and antrum into which the epidermis can grow, a tumor mass of cholesteatoma forms. When no such space exists, owing to contraction of the middle ear spaces or obliteration, complete healing of the middle ear becomes possible. The difference that exists between the chronic dangerous type of otitis media wherein healing results in complete epidermatization and the one in which cholesteatoma forms is, therefore, at first simply a question of whether or not the desquamated epidermis can find its way out to the external world through the external auditory canal. Should the products of desquamation be retained because of an inadequate opening, a cholesteatomatous tumor mass develops.

To assume, as Lautenschläger and Retjo do, that the growth of this mass is due mainly to the destructive action of the lipoidal substances on surrounding bone, is not borne out by anatomic facts. In the first place, the cholesteatomatous matrix separates the desquamated epidermis from the bone. To accept their theory, it must first be established that lipoidal substances penetrate the epidermal matrix in order to attack bone. Then again, were such the case, the finding of

13. Wittmaack, K., in Henke and Lubarch: Handbuch der Speziellen pathologischen Anatomie und Histologie, Berlin, Julius Springer, 1926, vol. 12, p. 246.

14. Almour, R.: The Significance of the Squamous Epithelium in the Cause and Repair of Chronic Middle Ear Disease, Tr. Am. Acad. Ophth., 1930, p. 357.

resorptive herds coming in direct proximity to the overlying matrix from perivascular spaces of the bone remains unexplained, as does also the cessation of the enlargement of the cholesteatomatous mass as soon as the external pressure on it is removed. The resorptive foci are not due to chemical reaction. They are a result of an attempt by nature to replace the subepithelial connective tissue destroyed by the cholesteatoma by calling into activity the connective tissue of the perivascular tissue of the bone. Retention of the desquamated epidermis is not in itself the sole cause of the tumor growth. Several factors, biologic rather than chemical in nature, play their rôle.

Manasse [15] was one of the first to call attention to them. He considered that an increased activity in the proliferation of the epidermis and the richness in vascularity of the new type of subepithelial tissue that the epidermis encounters in its growth into the middle ear were the factors of moment. In the whole question of the growth of cholesteatoma, from the clinical otologists' point of view, the danger lies not in the ingrowth of the epithelium but in the interruption of the egress of the desquamation from the cholesteatoma. The cholesteatoma may safely be carried as long as the desquamated epithelium can be removed. If the desquamated epithelium is obstructed in its removal, grave consequences are apt to ensue.

Finally, if one studies cholesteatoma from the standpoint of the healed cavity following radical mastoidectomy, one will be struck by the rationality of Wittmaack's observations. Such a cavity is deliberately covered with epidermis in order to heal it after all vestiges of diseased mucosa are surgically removed. After healing is completed, one observes that the healed cavity is actually lined with epidermis. In other words, it is a cholesteatoma-lined cavity. When such an ear is completely healed, it is necessary to keep it properly clean and to remove the débris, which accumulates from the desquamated epithelium, from time to time. If this is not done, trouble may ensue. If one examines this desquamated epithelium under the microscope it gives the typical appearance of the desquamated cholesteatomatous mass. Is one not right, then, in assuming that what the surgeon accomplishes with the use of the skin transplant, nature precedes him in doing in trying to heal chronic middle ear lesions the same way, i. e., by causing an ingrowth of squamous epithelium to cover and replace the diseased areas?

INFANTILE OTITIS

The controversy that has been raging since the presentation of the work of Marriott, Dean, Alden and others has again drawn the attention of many observers.

15. Manasse: Demonstration von Präparaten über Entstehung und Ausbreitung des Cholesteatoms, Verhandl. d. deutsch. oto. Gesellsch., 1913, p. 190.

Oreggia [16] expressed the belief that the reason for the controversy that exists in regard to the pathogenesis, symptomatology and treatment of infantile nutritional disorders due to otitis is primarily lack of definition and classification. He holds that it is important to differentiate between primary, real otitis and those otitides that occur secondary to other disease; to differentiate the manifest otitis from the latent otitis, and, above all, to distinguish between the toxic infections of infancy due to purulent otitis and the toxic infections that have otitis media purulenta as a complication. I feel that Oreggia has struck the keynote of the matter in his attempt to clarify the confusion that exists on the subject of the relationship between otitis media and gastro-intestinal intoxications in infancy.

The fine, painstaking research of Wishart [17] should be studied. Wishart made studies, covering five years, of groups of cases that showed an acute intestinal intoxication as a clinical entity. The cases showed the cardinal signs, namely, diarrhea, vomiting and drowsiness with absence of pus or blood in stools, temperature ranging from 102 to 103 F., ashen gray skin, sunken eyes, cold and clammy hands and feet, either cyanosed or gray, and a varying degree of dehydration. Wishart takes up the theory of an infection of the mastoid as a causative agent. The conclusion of his research is that infection of the mastoid antrum is not the cause of acute intestinal intoxication in infants. It is noteworthy, in looking over his records, that no consistent pathologic process is recorded for the disease in his many studies. In the discussion that followed Wishart's work at the American Otological Society in 1930, the point was stressed that whereas Wishart had subjected to investigation patients whose ears were not involved clinically, all of the cases originally reported by Alden showed such involvement. I feel that when the stage is reached when one can, with some degree of certainty, diagnose the nutritional disorder that has otitis media purulenta as the inciting factor, and when one can—which is rather difficult—diagnose the otitic infection in very young children with a larger degree of success, then the reports of the curative effects of aural surgical intervention in relation to cases in which there is a general disease will be in more general accord. The controversy is by no means settled, and the problem still remains in the realm of aural surgery. Wishart's work has undoubtedly stressed the opinion that aural surgical measures should not be employed unless suppuration of the middle ear is evidently present. An infant, suffering from a rapid dehydration and an evident gastro-intestinal infection with an

16. Oreggia, J. C.: La otitis del lactante, Arch. latino-am. de pediat. **23**:765, 1929.

17. Wishart, D. E. S.: Five Years' Study of the Relation of Infection of the Ear and Intestinal Tract in Infants, Tr. Am. Otol. Soc. **20**:100, 1930.

evident ear infection, will do better if the ear infection is eliminated. When no diagnosis of ear involvement is possible, surgical intervention on the ear should not be undertaken.

Rizzi [18] found purulent otitis media in 25 per cent of all autopsies performed on children. The pathway of infection in most instances was via the eustachian tube. In many cases the hematogenous route was the probable one, while in a smaller percentage of cases the aural infection was of meningeal origin. In cases in which death was due to nutritional disturbances, Rizzi feels that the presence of middle ear infection was responsible for the unfavorable course of the primary disease. In bronchopneumonia and in meningitis, however, he holds that the otitic lesion can be the immediate cause of death.

Holsclaw, Boehm and Bierman [19] studied cultures of the heart's blood taken from children who died of gastro-enteritis and found that septicemia plays an important rôle in the fatal outcome in these cases. In the majority of instances, the source of the sepsis was found to be acute purulent otitis media and mastoiditis. From their observations, these observers believe that early paracentesis and antrotomy will lessen the mortality among these cases.

In this connection, Wanner [20] discussed his experience with paracentesis, based on twenty-five years of study in a children's hospital. He feels that as a rule myringotomy is performed too often without absolute indications. He rarely finds it necessary to incise the drum. He stated that in "otitis media simplex" he performs a myringotomy only when the whispered voice is barely heard and tubal inflation no longer helps. To attempt to discuss such a report would necessitate a review of all the basic facts in connection with the indications for the performance of a paracentesis. At this time it is the consensus among otologists that otitis media simplex, more commonly known as acute catarrhal otitis media, never requires incision of the drum-membrane for its cure. I call attention to Wanner's paper only because it is of the utmost importance to the pediatricians that the otologic point of view should be given consideration, i. e., that paracentesis is performed for the evacuation of pus. In the absence of a diagnosis of purulent exudate in middle ear infections, paracentesis is not indicated.

Van Poole [21] made the assertion that in young children the drum is much thicker than in adults and consequently redness of the drum

18. Rizzi, G.: Ricerche batteriologische sull'otite media nella prima infanzia, Arch. ital. di otol. **41**:262, 1930.

19. Holsclaw, F. M.; Boehm, C. A., and Beirman, J. M.: Otitis Media and Mastoiditis in Infants Under Three Months of Age, Am. J. Dis. Child. **39**:747 (April) 1930.

20. Wanner, F.: Die Paracentese, Ztschr. f. Laryng., Rhin. **19**:349, 1930.

21. van Poole, G. M.: Acute Otitis in Children, Laryngoscope **40**:665, 1930.

either is not as marked or is absent. He therefore recommended paracentesis in doubtful cases. One cannot pass on this report without drawing attention to the fact that histologically it has been proved that there is no difference in consistency between the drum of an adult and the drum of a young child once the embryonic tissue has become absorbed. Van Poole repeated the outworn statement still found in most of the textbooks on pediatrics.

Shambaugh,[22] with his usual clear insight into a problem, gave the otologist a clear and concise idea as to indications for paracentesis in childhood. In infants in whom the mastoid process is not yet pneumatized and in whom the antrum and middle ear spaces are relatively large, paracentesis almost always suffices to clear up an aural infection without resort to antrotomy. Shambaugh called attention to an often overlooked factor at that age, namely, that the petrosquamous suture is still present as a connective tissue band and that consequently an edema, which often appears above the ear of an infant suffering from purulency of the middle ear, will go down and disappear after the performance of a paracentesis. However, when a subperiosteal abscess is found behind the ear, incision into this abscess may be necessary to clear up the lesion. Antrotomy is limited to cases in which there is definite evidence of bone involvement.

AIDS TO DIAGNOSIS

Bauer [23] prepared a filtrate of an aural discharge and injected it intracutaneously into a patient. This was followed by a strong positive reaction which appeared as a broad papule resembling an intensely positive Pirquet reaction. Subsequently, the case was definitely proved to be one of tuberculous otitis.

It is a striking observation to any one who reviews American and foreign literature that reports on tuberculous otitis are much more frequent abroad than in this country. It would seem that the diagnosis of tuberculous otitis is attended by many difficulties here; at any rate, it is not made as frequently. In view of the general prevalence of tuberculosis, it is surprising that so few reports on tuberculous otitis are to be found in the literature in America. At first glance, it was thought that the observation of Bauer might furnish a clue to the easy and early diagnosis of tuberculous otitis. On inquiry, however, it was found that other organisms besides the tubercle bacillus will give a wheal, or papules, when filtrates are made from them and injected intracutaneously. Besides, the diagnosis in Bauer's case appears to have

22. Shambaugh, G. E.: Diseases of the Ear in Childhood, Am. J. Dis. Child. **37**:1062 (May) 1930.

23. Bauer, J.: Zur Diagnostik der Mittelohrtuberkulose im Kindesalter, Med. Klin. **1**:847, 1930.

been finally established not by the injection of the filtrate, but by subsequent ordinary laboratory methods.

Retjo proposed the following test for the diagnosis of cholesteatoma: Two cubic centimeters of carbon tetrachloride is injected into the middle ear with the aid of an attic syringe and allowed to remain there from ten to fifteen minutes. This is then aspirated and enough carbon tetrachloride added to bring the quantity recovered up to 4 cc. The fluid is then filtered and enough carbon tetrachloride added to the filtrate to bring it to 5 cc. Now 2 cc. of glacial acetic acid and three drops of concentrated sulphuric acid are added to the filtrate. The mixture is then shaken and put in a dark place. In the presence of a cholesteatoma, a characteristic green color appears in about fifteen minutes. For color comparison Retjo employs a solution of naphthol green-B as prepared by the I. G. Farben Company. A marked approach to this color suggests a diagnosis of cholesteatoma in a case of chronic purulent otitis media.

Finally, Rothe [24] reported an interesting reflex observed in very young children suffering from otitis media. This consists of a contralateral dorsiflexion of the large toe and fanning of the other toes, not unlike a Babinski sign, brought about by pressure exerted at the point of intersection of an imaginary horizontal line through the upper auricular attachment, and another running vertically through the fossa mastoidea. In infants, the point of pressure is in the notch of the posterolateral fontanel. Rothe cautioned that this reflex, known as Grünfelder's reflex, will not be elicited unless the points previously mentioned are carefully located. At this time it is hard to determine the clinical value of the sign. It can hardly serve as a diagnostic aid to the otologist, and in the hands of those other than specialists it may lead to errors in interpretation and to subsequent unsound therapeutic measures. Too frequently in the past, others than otologists have misinterpreted aural findings and have attributed to the ears many fevers of undetermined origin. Any additional sign or symptom that is not absolute in its diagnostic value may add to the confusion that already exists in circles other than otologic. I comment on the test so that it may be used and additional information acquired.

CLINICAL REPORTS

Segura [25] approached the aural complications noted in the course of scarlet fever with a point of view that differs from most. Politzer furnished the basis for the common belief that otitis appearing at the

24. Rothe, H.: Der Grünfeldersche Sehenreflex, ein neues Symptom der Otitis media im Kindesalter, Deutsche med. Wchnschr. **2**:1822, 1930.

25. Segura, E. V.: Complicaciones óticas de la escarlatina, Rev. oto-neuro-oftal. **5**:104, 1930.

commencement of an attack of scarlet fever is more dangerous than that occurring during the convalescent period. From his observations, Segura did not substantiate Politzer; neither did he agree with the hematogenous theory of aural infections during scarlatina. He holds that otitis is always an extension of an infection in the pharynx, and that since scarlet fever is a specific infection, the variations noted in the severity of the otitis in different cases must be due to the presence of some particular predisposition, such as patency of the eustachian tube, dehiscences in the bony walls and, especially, pathologic pneumatization of the mastoid process. The severe forms of otitis media purulenta in scarlet fever are always of the pathologic type known as otitis necroticans. In this connection, Wittmaack's explanation of the chronicity of this type of otitis is more logical, based as it is on pathologic proof and not on clinical conjecture. The otitis media necroticans of scarlet fever is a result of a mass necrosis of the mucosa of the middle ear which brings the periosteum in direct contact with the suppuration. The periosteum is destroyed by the suppuration and the reparative process is left entirely to the connective tissue found in the perivascular spaces of the bony tympanic walls. This connective tissue proliferates, surrounds areas of bone and results in a rarefying osteitis, protruding into the middle ear in the form of granulations or polyps. When, in such a condition, there is a pneumatic mastoid process present, an acute mastoiditis will ensue which, because of its symptomatology, demands surgical intervention, and will eventually be relieved thereby. The middle ear itself, however, will continue to discharge. In other words, the chronicity of the middle ear suppuration will continue after the operation on the mastoid process. When, however, because of faulty pneumatization owing to causes that Wittmaack has outlined, a nonpneumatized mastoid is present, acute mastoiditis cannot occur and the chronic lesion will run its course throughout life without the development of an acute mastoidal lesion. On the other hand, Wittmaack feels that when normal pneumatization is present, it is unlikely that otitis occurring during an attack of scarlet fever will assume the necrotic form. Such an otitis is more apt to attack the mucosal surface and result in an acute lesion which will either resolve spontaneously or be cured by surgical intervention on the mastoid process.

Rüter [26] reported an unusual form of ear suppuration that resulted from an infection by a diphtheria bacillus. In a woman 31 years of age, right purulent otitis media developed following a sore throat. The continued high fever and severe pain led to the performance of a mastoidectomy. The culture of the pus from the mastoid process yielded a pure growth of *Bacillus diphtheriae*. At no time was any membrane

26. Rüter, E.: Ueber einen Fal von Otitis media diphtherica, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **124**:286, 1930.

observed in the ear to make one suspect the clinical presence of this infection. Diphtheria antitoxin seemed to have no influence on the high septic temperature and stormy clinical course. At the end of the sixth week of illness, the sinus and internal jugular were operated on and recovery set in. In the healing of the mastoid wound, which progressed slowly, extensive formation of sequestrums was observed.

Barenberg [27] reported three cases of Vincent's infection of the ear, all of which seemed to run a similar course which, he believes, is typical. The first case was one of acute purulent otitis media following an acute Vincent's infection of the mouth of two years' standing. The discharge lasted twenty-three days and was then followed by a serosanguineous, foul-smelling otorrhea. There were marked swelling of the concha, edema of the canal and sometimes free bleeding from the ear. The cervical glands were enlarged. Mastoid tenderness was absent. Vincent's organism was isolated from the discharge, and arsenic therapy was instituted. Within forty-eight hours after the commencement of specific treatment, complete healing resulted. The second case was one of chronic purulent otitis media with an acute exacerbation accompanied by swelling of the concha and edema of the canal. Vincent's organism was isolated, and within twenty-four hours after institution of arsenic therapy the acute symptoms subsided. The aural discharge, however, persisted for two years. The third case was similar to the second with the exception that there was no swelling of the auricle. It is well, in view of these reports, to keep in mind that acute middle ear suppuration associated with a foul-smelling discharge and swelling of the canal and auricle may possibly be an infection of this type, for which there is specific therapy.

Cusenza [28] reported three cases of acute articular rheumatism that had their initial lesion, or origin, in the ear. In two of the cases there were first severe aural pain, subjective ear noises and a markedly inflamed tympanic membrane which required incision. Chills and high fever rapidly set in, followed by migratory pains in the joints. Cure was obtained in two cases in this series by salicylate therapy. In the third case, otorrhea of seven years' duration was present. Acute exacerbation set in with mastoidal involvement which required operation. High fever and pains in the joints caused a sinus thrombosis to be suspected. Under salicylate therapy the patient responded, and no operation was done on the suspected complicating lesion. Cusenza's report leaves one in doubt as to the organisms involved.

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27. Barenberg, L. H., and Lewis, J. M.: Vincent's Infection of the Ear, J. A. M. A. **94**:1065 (April 5) 1930.

28. Cusenza, G.: Reumatismo articolare actuo e otite media, Valsalva **6**:707 1930.

Campbell [29] reported the rupture into the external auditory meatus of a purulency of the deep-seated glands located at the base of the skull internal to the mandibular joint. Healing was accomplished by surgical drainage of the area located between the mastoid tip and the ascending ramus of the mandible. Such cases are not uncommon in young children in whom the tympanic ring has not yet reached full growth. I have seen a case in which, after a simple mastoidectomy, repeated attacks of aural discharge occurred at intervals. In my case, the drum was normal at all times. On the floor of the external canal, at the junction of the membranous and the cartilaginous canal, a fistulous opening was found which led downward and inward into the neck in the region described by Campbell. Iodized poppy-seed oil 40 per cent was injected into the tract and the path was found to lead to a large pocket between the angle of the jaw and the mastoid process. Apparently the injection of iodized oil sufficed to cure the lesion because the tract has not since suppurated. A condition such as Campbell describes might be mistaken for a middle ear purulency. The exact findings on the drum and careful inspection of the external auditory canal clarify the diagnosis.

TREATMENT

Blau [30] reported the successful use of an alcoholic solution of a complex iron salt of iodine containing minimum quantities of chlorine, bromine and fluorine. He used this preparation in six cases of middle ear suppuration, and recorded that it has a high degree of potency for disinfection. He found that its best results are in staphylococcic and tuberculous infections.

In publishing his suggestion of therapy for chronic suppuration, I call attention to the fact that while the agent he suggests may kill bacteria in cases in which the middle ear is infected, when the middle ear lesion involves bone, the decaying process produces a discharge that empties into the external auditory canal as an otorrhea, the use of bactericidal agents will be of no avail. In other words, an infection of the tympanic mucosa might well yield to disinfecting agents, but the latter can have no effect on bone caries, bone necrosis or cholesteatoma since the pathologic process that is then presented is not such as would be influenced by a disinfectant.

Landry, Franquet and Paris [31] reported interesting results from experiments conducted with ionotherapy. They showed that in rabbits

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29. Campbell, E. H.: Rupture of Abscesses into External Auditory Canal, Ann. Otol., Rhin. & Laryng. **39**:144, 1930.

30. Blau: Metajodin bei Mittelohrentzündungen, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **126**:273, 1930.

31. Landry, Franquet and Paris: La pénétration ionothérapique par la voie transtympanique, Ann. de mal. de l'oreille, du larynx **49**:235, 1930.

the ionization of magnesium sulphate, which they place in the external canal in the presence of an intact drumhead, results in the passage of the magnesium ions through the drum into the middle and inner ears. Daily ionization of magnesium sulphate resulted in an increase of magnesium in the urine and feces of the animals experimented on. The increase of magnesium in the urine persisted for fourteen days after the cessation of ionization. In addition, chemical analysis of the temporal bone showed a marked increase in the quantity of magnesium. This experiment is of value in showing that one has, through ionization, a means of carrying drugs deep into the tissues of the middle ear.

Lorenzo [32] reported three cases of tuberculosis of the middle ear and mastoid process. He stated that the diagnostic clinical signs fall into three groups. The first shows tubercles on the drum, followed by perforation, sequestration and caseation of the bone. The second group shows the onset of an acute middle ear infection with painless perforation of the drum, circular stenosis of the osseous external canal, profuse granulations in the middle ear and early fistulous tract formations over the mastoid process. The last group has an active pulmonary tuberculosis, positive skin tests, tuberculous periauricular adenitis and facial paralysis in the course of otitis media purulenta with multiple perforations of the drum and the reappearance of granulations soon after their removal. Lorenzo holds the generally accepted view that tuberculosis of the ear is always a secondary infection.

Fioretti [33] reported the case of a patient 38 years of age who had a typical clinical and hematologic picture of lymphatic leukemia. This patient presented, in addition, chronic purulent otitis media with a central perforation of the drumhead. Histologic examination of the granulation tissue removed from the middle ear demonstrated a leukemic infiltration of the middle ear mucosa.

Jones [34] reported a case of hemangioma of the tympanic cavity. The patient, 60 years of age, had an aural polyp removed many years prior to the time he first came under Jones' observation. Recurrence of profuse otorrhea with a large polyp that bled profusely when touched led eventually to a radical operation which disclosed the tumor to be a hemangioma.

Lure [35] reported two cases of primary carcinoma of the middle ear in patients 28 and 32 years of age, respectively. He operated on them,

32. Lorenzo, A.: Tuberculosis del odio medio y de la mastoides, Rev. otoneuro-oftal. **5**:77, 1930.

33. Fioretti, F.: Un caso di leucemia linfatica con localizzazioni all'orecchio medio, Valsalva **6**:167, 1930.

34. Jones, J. A.: Haemangioma of the Tympanic Cavity, J. Laryng. & Otol. **45**:265, 1930.

35. Lure, M.: Concerning Primary Carcinoma of the Middle Ear, Z. ušn. Bol. **7**:417, 1930.

and the operations were followed by a more rapid growth of the tumor. He believes that operation in these cases is contraindicated. He reported the failure of roentgenotherapy in his cases.

Retjo [36] treated patients with cholesteatoma by thoroughly drying the ear, removing as much as he could of the cholesteatomatous mass and then applying an alcoholic solution of carbon tetrachloride to the attic and the antrum. He reported good results from this measure.

SINUS THROMBOSIS

Eggeston,[37] in his paper on bacteremia due to otitic foci, stressed the importance of blood counts in diagnosis and prognosis in cases of otitic sepsis and the importance of the staff cell count in the estimation of blood stream complications. As regards the importance of blood cultures, he holds that they are more apt to be positive when a mural thrombus is present in the sinus but that negative blood cultures do not rule out the presence of a sinus thrombosis. He believes that the Tobey-Ayer test is apt to give a positive response earlier than culture of the blood stream.

Effler [38] reported a case of otitic pyemia in a youth 17 years of age. The case was one of cholesteatoma in which a deep abscess of the neck, extradural abscess and pulmonary metastases developed. At operation, no vestige of the lateral sinus was found. Operation on the ear and evacuation of the pus in the neck and the pleural cavity resulted in eventual recovery. The internal jugular vein was not ligated.

I comment on this case because of an experience of my own with a case that, at operation, showed an obliteration of the lateral sinus. The patient had had a lateral sinus thrombosis which had eroded through the mastoidal wall and the mastoidal plate of the sinus, and the interior of the lateral sinus was in contiguity with the purulent contents of the mastoid process. On the removal of all the detritus, the visceral wall of the sinus presented itself. The patient, having given the symptomatology of a general sepsis, had been subjected to an exploration of the sinus, and the mesial wall had been incised by mistake, exposing the viscera of the posterior cranial fossa. Effler's report is of moment in drawing attention to the possibility of such a happening.

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36. Retjo, A.: Sopra la terapia delle suppurazioni dell'orecchio medio complicate da colesteatoma, Valsalva **6**:281, 1930.

37. Eggeston, A. A.: The Clinical Pathology of Mastoiditis with Special Reference to Bacteremia and Treatment by Blood Transfusions, Laryngoscope **40**: 424, 1930.

38. Effler, L. R.: Destruction of the Lateral Sinus, Laryngoscope **40**:39, 1930.

Valenti [39] discussed the clinical value of pulsations of the lateral sinus. Normally, the sinus shows no pulsations. It pulsates only when its elasticity is pathologically altered, and then the pulsations are indicative of a thrombus within the vein. In some cases a sinus will pulsate when only a periphlebitis exists, but here the pulsations will cease as soon as the granulations on the sinus wall are removed. The pulsations of the sinus are transmitted from the blood vessels of the underlying cerebral tissue. It is possible that a thrombosed sinus may not pulsate. When such is the case it is highly probable that the thrombus has undergone purulent disintegration. The observations of Valenti may seem academic, but the importance of reiterating his remarks is obvious when one realizes the frequency with which pulsating sinus walls are mistaken for normal walls. There are still otologists who report the sigmoid sinus as normal because it was seen to pulsate. I have in mind one instance in which the sinus was not opened in the presence of a positive sepsis because at operation the sinus was, in the opinion of the otologist, "pulsating normally." It may also be stated in passing that there is an erroneous notion that the respiratory and cardiac pulsations of the internal jugular can be transmitted upward to the lateral sinus. This never occurs.

Pagano [40] reported seven cases of sinus thrombosis, in six of which he performed a jugular ligation. Four of the six patients recovered. The remaining patients on whom he did not operate also recovered. He feels that while it is erroneous to generalize as to the operative treatment to be employed in cases of otitic sepsis due to sinus thrombosis, jugular ligation is the most important factor in stopping the spread of infection and consequently offers the best method of attacking the lesion. This opinion will find agreement among most otologists in spite of the fact that it does not result in cure in all cases of sinus thrombosis, some of which are beyond the control of the surgeon. This lack of control rests on the extension of the septic thrombus into the venous channels that empty into the sigmoid sinus and the jugular bulb. When the condylar and the petrosal veins, the marginal sinus or the basilar sinus become involved by an extension of the thrombus, surgical approach to the areas involved is not yet possible. These infected areas act as the course of continuance of the general sepsis. On the other hand, modern surgical procedures have gained control over early diagnosis, early operation and thorough eradication of the lesion when it is located in the lateral sinus and the jugular bulb, and recoveries far outnumber losses in such cases. Surgical intervention should be done early.

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39. Valenti, S.: Valore clinico della pulsazione del seno transverso, Boll. d. mal. d. orecchio, d. gola e d. naso **48**:129, 1930.

40. Pagano, A.: Considerazioni su 7 casi di tromboflebite del seno laterale e della guigulare interna, Arch. ital. di otol. **41**:209, 1930.

Hybasek,[41] in an article on the treatment for otogenic thrombophlebitis, advises thorough washing out of the bulb in every case in which the thrombus has extended into this region. In addition, he feels that the method of blocking the sinus is of more importance than is usually believed. He inserts the upper plug 1.5 to 2 cm. behind the estimated end of the thrombus. In order definitely to determine the course of the transverse portion of the sinus in cases in which the thrombus extends backward toward the torcula, he employs an olive-tipped sound which he inserts through an opening made at the knee. He advocates the performance of the radical mastoid operation in cases of primary jugular bulb thrombosis in addition to the necessary surgery on the vein. In this way, he feels that there cannot occur the retention of pus that might take place were a simple mastoidectomy performed. It is not clear to me what additional ground is gained by the performance of a radical operation when approaching the bulb to clean it out. This requires removal of the posterior wall of the external auditory canal, as well as a sacrifice of the structures of the middle ear and the floor of the tympanum, in order to get to the bulb—a very difficult procedure. No more of the area of the vein is exposed by doing a radical than by doing a simple operation. The success that has heretofore attended the evacuation of a thrombus located in the jugular bulb with surgical measures limited to simple mastoidectomy makes one hesitate to accept the procedure advocated by Hybasek.

In another paper, Hybasek[42] reported seventeen cases of otitic sepsis, twelve of which showed sinus thrombosis, two primary bulb thrombosis and three thrombosis of the mastoid emissary vein. The purpose of his report is to call attention to the last named site of thrombosis as a source of sepsis. He stated that it is not rare and occurs more frequently than cavernous sinus thrombosis due to aural disease. The three cases he reported all occurred during the course of an acute otitis media and mastoiditis. When a sepsis occurs and no thrombus is found in the sinus or bulb, the mastoid emissary vein should be inspected. This should be done particularly when Greisinger's sign is present. Hybasek called attention to the fact that a thrombus in the emissary vein can spread to the cutaneous occipital vein and from there into the posterior external jugular, in this way continuing the sepsis, after exploration of the lateral sinus in the usual manner. In the study of cases of otitic sepsis this report of Hybasek is of great importance.

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41. Hybasek, J.: Treatment of Thrombophlebitis of Otitic Origin, Časop. lék. česk. **69**:1181 (Aug. 15) 1930.

42. Hybasek, J.: Primary Otogenic Thrombophlebitis of the Vena Mastoidea, Otolaryng. Slav. **2**:353, 1930.

Fioretti [43] reported a case of sepsis due to *Streptococcus viridans*. This organism, which is a normal inhabitant of the oral cavity, generally causes a mild, long drawn-out sepsis such as is commonly found in subacute bacterial endocarditis. His patient, who was 21 years old, had an acute angina followed by purulent otitis which subsequently developed into acute mastoiditis. Simple mastoidectomy was followed in four days by acute septicopyemia and the development of numerous metastases. Blood culture yielded *Streptococcus viridans*. I have occasionally found *Streptococcus viridans* in the blood stream on blood culture in cases of septicemia after mastoidectomy, but never in my experience has this finding been followed by the finding of thrombosis in the lateral sinus, and I am inclined to believe that the *viridans* does not produce a sinus thrombosis. The *viridans*, however, does produce septicemia, and very exact general examination is often necessary to determine the lesion producing the blood stream infection. In most of my own cases a cardiac lesion was found and, in spite of no operation on either the lateral sinus or the internal jugular, none of my patients came to autopsy or died of lateral sinus thrombosis.

43. Fioretti, F.: Un caso di settico-piemia da Streptococco viridans, d'origine otomastoidea: Guarigione, Valsalva **6**:595, 1930.

Abstracts from Current Literature

Ear

OTITIS MEDIA: ITS MANAGEMENT AND TREATMENT. CLYDE E. HARNER, California & West. Med. **34**:156 (March) 1931.

The treatment for otitis media is outlined with reference to incision of the drum, when necessary, and to the general after-care of the ear. Certain general and supportive measures are advocated, including the treatment of the throat and nasopharynx during the acute stage.

DICKEY, San Francisco.

OTITIS MEDIA AND MASTOIDITIS DUE TO STREPTOCOCCUS EPIDEMICUS. I. PILOT, M. LAMPERT and D. J. DAVIS, J. Infect. Dis. **48**:499 (May) 1931.

The authors believe that Streptococcus epidemicus may be the cause of many infections of the tonsils and middle ear. Even though these complications may occur after scarlet fever, the authors have demonstrated S. epidemicus as the etiologic factor, and infer either that this infection is superimposed on the original one, or that this type of organism may be another variety of S. hemolyticus, capable of causing scarlet fever. Clinically, the authors admit that there were no absolute differentiating points between the conditions noted as caused by S. epidemicus and those caused by some other streptococcus.

TOOMEY, Cleveland [AM. J. DIS. CHILD.].

PRESENT-DAY METHOD FOR TESTING THE HEARING AMONG SCHOOL CHILDREN. EMILY A. PRATT, New York State J. Med. **31**:81 (Jan. 15) 1931.

The Medical Inspection Bureau of the State Department of Education is urging the general use of the phono-audiometer for testing the hearing of all school children. Tests were made in several cities of the state; 18,198 children were tested; 6.4 per cent gave evidence of defective hearing; 59 per cent of these deaf children were found to be backward in school, being one or more grades behind the average.

AIKMAN, Rochester, N. Y.

INVESTIGATIONS ON THE INDIVIDUAL HISTOLOGY OF CONNECTIVE TISSUE: PNEUMATIZATION OF THE TEMPORAL LOBE. M. SCHWARZ, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:1 (June 6) 1931.

In his investigations of whether in different persons there are microscopic differences in the structure of the connective tissue, Schwarz first made studies on the mucous membrane of the upper respiratory tract of adults. But since these investigations did not lead to definite results, he studied the filling tissues of the fetal tympanum. He examined the temporal lobes of 101 fetuses and new-born infants. Two of the specimens were from third month fetuses, seven from fourth month fetuses, three from fifth month fetuses, three from sixth month fetuses and four from seventh month fetuses, and from the later fetal months there were larger numbers of specimens. Considering the small number of specimens from the first fetal months, the results of the examinations have to be accepted with certain reservations. However, the number of specimens from fetuses from the later fetal months and from the new-born is sufficiently large. After describing the method of his studies and after outlining the structure of the embryonal and of the unformed loose, fibrillar connective tissues, the author reports his observations on the individual changes in the structure of the filling tissues in the middle ear. He discusses the fixed connective tissue cells, the histiocytes, the intercellular substance and the collagenic fibers. In discussing the structural types, he states that he observed individual variations in the behavior of the tympanal filling tissues,

in the cellular constituents as well as in the intracellular substance. In comparing the filling tissues of the tympanums of the fetuses during the more advanced stages of development, he noted three main types, and he describes their characteristics. The individual variations are due primarily to the varying behavior of the fibroblasts. In the second part of the article the author discusses the relations between the filling tissues and the pneumatization of the tympanum. He describes five stages in the pneumatization and in the gradual disappearance of the filling tissues, and he thinks that in the pneumatization the individual factor is of great significance.

EDITOR'S ABSTRACT.

RELATIONS BETWEEN DISEASES OF THE NOSE AND THOSE OF THE MIDDLE EAR (NOT INCLUDING SYPHILIS AND TUBERCULOSIS). H. RICHTER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:30 (June 6) 1931.

The results of his observations on relations between diseases of the nose and those of the ear Richter sums up as follows: 1. Acute infectious rhinitis, because of its combination with acute pharyngitis, often leads to closure of the tubes and to infectious inflammatory diseases of the middle ear. It can be considered as the main cause of these disorders. 2. Vasomotor or nervous rhinopathies, when not combined with acute inflammatory diseases of the internal nose, are not causal factors of diseases of the ear. 3. Simple or hyperplastic chronic rhinitis has only rarely an etiologic relationship to ear diseases, provided acute inflammatory changes do not complicate them. 4. The fetid or the nonfetid forms of chronic atrophic rhinitis frequently cause changes in the tube and in the middle ear. This is due to the fact that the chronic inflammatory process often spreads to the extranasal mucous membranes of the upper air passages. 5. Deformities of the nasal septum alone do not cause ear diseases, but in cases of inflammatory diseases within the nose or its accessory cavities, when they hinder the discharge of the secretion, they are a predisposing factor. 6. Inflammatory diseases of the accessory nasal cavities often lead, by way of the nasopharynx, to closure of the tubes and to inflammations of the middle ear. This is the case in suppurative as well as in nonsuppurative forms of sinusitis. The infectious factor seems to be of primary importance for the transmission. 7. Tumors of the internal nose cause ear diseases when malignant blastomas either grow in the nasopharynx or, as in most cases, concur with suppurations of the accessory nasal cavities. On the basis of these observations the author concludes that changes in the region of the nose, the main symptom of which is inhibited nasal breathing, such as vasomotor and nervous rhinopathy, simple or hyperplastic chronic rhinitis and the deformities of the nasal septum, are erroneously considered as the cause of occlusion of the tube or of infectious inflammatory diseases of the middle ear. Their etiologic significance for ear diseases has been overestimated. The author's observations also indicate that in ear diseases nasal intervention should be made only if critical examination proves it to be necessary, and the nasopharynx should always be carefully examined before the therapeutic procedure is decided on.

EDITOR'S ABSTRACT.

ISOLATED CHONDROMA IN THE BONY PORTION OF THE EXTERNAL AUDITORY MEATUS. E. LÜSCHER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:63 (June 6) 1931.

Lüscher considers isolated chondroma of the external auditory meatus as extremely rare, and he therefore reports a case that came under his observation. In a boy, aged 11, who never before had had ear disease, there developed an acute diffuse otitis externa. The examination revealed in the middle of the swollen, pus-filled auditory meatus a solid, reddish, polyp-like tissue cone. After the inflammatory changes had disappeared, the growth was removed, and the recovery was uneventful. Histologic examination of the tumor revealed that it was an isolated chondroma consisting of a nucleus of elastic, reticular cartilage covered with normal skin. The author reviews similar reports from the literature, and he expresses the opinion that in some instances these formations are true neoplasms;

in other cases, however, and also in the one observed they are congenital deformities which, in analogy with the tags of skin with a cartilaginous nucleus near the pinna, may be considered as a product of the first branchial arch.

EDITOR'S ABSTRACT.

TONUS OF SENSORY TERMINATIONS OF INTERNAL EAR: TONUS AS FOUNDATION OF NORMAL STIMULATION PROCESS PARTICULARLY IN COCHLEAR APPARATUS. K. WITTMAACK, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:118, (June 26) 1931.

Wittmaack shows how the vibrations of the fluid of the labyrinth are transmitted to the organ of Corti or to the auditory nerve. He first discusses the structure of Corti's organ, particularly that of Corti's membrane and its relations to Corti's organ. He is convinced that Corti's membrane does not float free above Corti's organ but is directly connected with it, and that the two together form one apparatus, which in all directions is shut off against the endolymph space of the ductus cochlearis. Thus the liquor spaces within this apparatus are not in free communication with the liquor of the ductus cochlearis. There are indications that Corti's membrane has a certain degree of turgescence. This turgescence must be maintained against the pressure of the endolymph in the ductus cochlearis. The equilibrium between the two pressures is the biologic foundation for the estimation of the stimulation process. Fluctuations in the tonus of the organ of Corti alone do not produce stimulation. However, it may be assumed that in the cochlear apparatus, similar to the conditions in the vestibular apparatus, physically produced pressures that are not dependent on the tonus may effect stimulation. The generally accepted idea that the stimulation process in Corti's organ is due to influences that are exerted on the hair cells is, according to the author's opinion, no longer tenable. He thinks that the specific sense perception cannot be due to shifting or bending of the hair cells, but rather that it is based on the capacity to perceive minute pressure differences that have been transmitted by hydrostatic means. The essential difference between the vestibular and cochlear conditions is that for the stimulation of the sensory terminations of the vestibule one or several pressure fluctuations that follow each other after longer intervals are adequate, whereas the adequate stimulation for the organ of Corti consists in rhythmic, short, internal pressure fluctuations. That in the course of the phylogenetic development the separation of the organ of Corti from the complex of sensory terminations of the vestibular apparatus was due to the fact that the organ of Corti has a new functional task, for which the sensory terminations of the vestibular apparatus were not equipped, has been generally accepted as the foundation for the ideas about the function of the vestibular, as well as of the cochlear, apparatus. The author further discusses the biologic foundations of the process of stimulation and then the stimulation process in relation to the theories of sound perception. He thinks that his observations corroborate the Helmholtz theory.

EDITOR'S ABSTRACT.

INFLAMMATORY DISEASES OF THE MIDDLE EAR: PATHOLOGIC ANATOMY OF SPONTANEOUS AND EXPERIMENTAL INFLAMMATORY CHANGES OF THE MIDDLE EAR AND REMARKS ON THE STRUCTURE OF THE MIDDLE EAR. M. MEYER, Ztschr. f. Laryng., Rhin. (teil 1: Folia oto-laryng.) **20**:89 (Jan.) 1931.

Studies on monkeys, on macaques as well as on hamadryas, convinced Meyer that the anatomic structure of the middle ear of these animals closely resembles that of the human ear and that for this reason they are suitable for experiments. It was also found that the cavities of the middle ear react readily to inflammatory irritants, chemical as well as bacterial, and that the resulting inflammation may, with certain reservations, be compared with the inflammatory processes in the human ear. By suitable experimental arrangements it is possible to produce catarrhal, suppurative, necrotic and chronic inflammations even with residue forma-

tion and ossification. Because of the limited number of experiments it is as yet not possible to make definite statements in regard to the predisposing factors in each type of inflammation. Even to a single localized chemical irritation of short duration, and more yet to other irritants, the entire system of cavities with all its ramifications reacts with inflammation. The inflammation is, however, not uniformly distributed, nor is it more marked at the site of irritation. Because it was found in catarrhal (chemical) as well as in suppurative (bacterial) inflammation that in the region of the mastoid near the site of irritation the inflammation was less severe and less suppurative than in the more distant tympanic cavity, it should be investigated whether perhaps local conditions cause the variations in the reaction. On three pretrosas, observations could be made on the various changes in the mucous membrane after inflammations had been produced with the different irritants. There were all possible changes, from entirely normal to markedly edematous or hyperplastic mucous membrane. From the edema there developed indurations with submucous formation of vesicles and cysts; this was followed by tearing of the fine net of connective tissue, and finally submucous organization set in. The edematous mucous membrane may contain pus corpuscles in varying numbers. In close proximity there occur, without apparent reason, all different degrees of changes, and this indicates that the varying pictures are different reactions rather than different stages. Organization processes could be observed in catarrhal as well as in suppurative inflammations as early as seven days after the beginning of the disturbance. It was observed in one case that as a result of exudate organization in chronic or relapsing acute otitis media, there formed connective tissue with severe adhesions, ossifications with stapes ankylosis and occlusion of the fenestra rotunda. Because in one of the monkeys a formation resembling cholesteatoma was found, it appears possible to produce cholesteatoma experimentally. Pictures that could be interpreted as progressive pneumatization were also found in one of the monkeys.

EDITOR'S ABSTRACT.

THE PHENOMENA OF MENIÈRE'S DISEASE. F. H. QUIX, Nederl. tijdschr. v. geneesk. **75**:366 (Jan. 24) 1931.

In the case described by the author, Menière's disease began with tinnitus in the left ear, followed after a year by vertigo and vomiting. The otologist at the time could discover only a slight labyrinthine dysfunction and nystagmus which was less prominent with the left ear than the right. Several years of improvement followed. Four years later, the seizures recommenced more violently. The vestibular reflexes on the left side were more difficult to elicit than those on the right. After a time these objective differences disappeared, the seizures of vomiting and vertigo ceased, and the only residue was a diminution in hearing on the left side. It is noteworthy that in Menière's disease the patient may remain free from symptoms of disease during the free intervals, so the otologist is obliged to discover the signs through labyrinthine stimulation and tests for hearing at the time of the attacks. Hence the great difference in the objective signs during the attack as contrasted with the free intervals. Nystagmus and vasomotor and secretory processes in other parts of the body disappear rapidly. The disturbance of hearing, mostly of labyrinthine character, can change, be absent or disappear. Signs of labyrinthine irritation and paralysis, which manifest themselves through nystagmus, caloric reaction, past pointing and galvanic excitability, also fluctuate in the same manner.

HART, Greenwich, Conn. [ARCH. NEUROL. & PSYCHIAT.].

Pharynx

OCCURRENCE OF NUMEROUS LARGE GIANT CELLS IN THE TONSILS AND PHARYNGEAL MUCOSA IN THE PRODROMAL STAGE OF MEASLES. A. S. WARTHIN, Arch. Path. **11**:864 (June) 1931.

Peculiar changes in the tonsils of four patients in whom measles developed in from one to five days following tonsillectomy are described. These consisted of

a subepithelial infiltration of multinuclear giant cells, lymphocytes and monocytes. There was lymphoid exhaustion of the germinal centers with the production of the multinuclear giant cells from cells of the lymphoblastic type, and migration of these cells toward the mucosa. "The pathology is so distinctive that a positive diagnosis of measles may be made from one to five days before the exanthem appears." It was thought that the causative organism of measles was probably phagocytosed by the giant cells, but although numerous methods of staining were used, no organism was demonstrated.

LESLIE, Evanston, Ill. [AM. J. DIS. CHILD.].

TONSILLECTOMY IN CARRIERS OF STREPTOCOCCUS EPIDEMICUS. I. PILOT and D. J. DAVIS, J. Infect. Dis. **48**:501 (May) 1931.

Tonsillectomy is suggested by the authors for all dairy men who perform milking, since a person may harbor Streptococcus epidemicus in the tonsil crypts without its being demonstrable by smear. Tonsillectomy, in their experience, causes the disappearance of this organism in most cases. Reinfection of the throat even in tonsillectomized cases may occasionally occur. This operation had a favorable clinical effect on some arthritic patients.

TOOMEY, Cleveland [AM. J. DIS. CHILD.].

EXPERIMENTAL INVESTIGATIONS ON THE ELECTIVE LOCALIZATION CAPACITY OF TONSILLAR BACTERIA. E. WIRTH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **28**: 189 (May 26) 1931.

Wirth points out that Rosenow's theory of the elective localization capacity of bacteria, if corroborated, would be of great significance for the recognition of relations between the tonsils and systemic diseases. He tested rabbits for the elective localization capacity of the tonsillar bacteria of twenty-nine patients with various systemic diseases. In all, 141 rabbits were inoculated with tonsillar bacteria. In most cases two or three rabbits were given an intravenous injection of from 0.5 to 2 cc. of a fresh suspension of tonsil pulp, and two or three other animals were given an injection of from 0.5 to 2 cc. of a mixed bouillon culture. Macroscopic and bacteriologic examination of the 141 rabbits revealed articular changes in 43 per cent, bacteria in the blood in 30 per cent, exudate in the abdominal cavity in 30 per cent, albuminuria in 21 per cent, intestinal changes in 12 per cent, splenic tumor in 10 per cent, changes in the lungs in 9 per cent, gastric disorders (generally ulcers) in 8 per cent, disorders of the liver in 5 per cent, endocardial changes in 4 per cent, pericardial changes in 4 per cent and changes in the appendix in 2 per cent. A difference in the outcome of the animal experiments when bouillon with liver or Rosenow's dextrose-brain bouillon was used could not be detected. In fifteen cases of articular rheumatism, the result of the inoculations for detecting elective localization was: positive nine times, questionable three times and negative three times. In three cases of sepsis the results were positive twice and negative once; in six cases of nephritis, questionable three times and negative three times. In three cases of endocarditis, in one case of appendicitis and in one case of cholecystitis an elective localization capacity of the tonsillar bacteria was not demonstrable. It was never possible to produce in the animals symptoms similar to those of nephritis in human beings. Marked differences in the percentile involvement of the various organs could not be detected in the different groups of systemic diseases. For instance, the joints of the rabbits inoculated with bacteria from patients with articular rheumatism showed changes in 43 per cent, and those inoculated with bacteria from patients with nephritis, changes in 39 per cent; in those inoculated with bacteria from patients with other systemic diseases articular disorders developed in 42 per cent. Thus the author's experiments speak against a marked elective localization capacity of tonsillar bacteria, as was asserted by Rosenow. However, it could be observed that bacteria from different tonsils actually have a varying tendency to attack certain organs. The frequently demonstrable arthrophilia of the tonsillar bacteria and of their toxins is especially noteworthy. Arthrotropic tendencies are noted most frequently in hemolytic strepto-

cocci, less often in other forms of streptococci, in pneumococci and in anaerobic, gram-negative bacteria. The bacteria in acute tonsillitis show generally a more marked arthrophilia than those in chronic tonsillitis. These observations make it appear probable that arthrophilic tonsillar bacteria are a causal factor in articular diseases that develop in the course of acute or of chronic tonsillitis, irrespective of the eventful existence of a specific causal agent for the real "rheumatismus infectiosus."

EDITOR'S ABSTRACT.

Larynx

PRESENT STATUS OF EVALUATION OF STROBOSCOPIC FINDINGS FOR PATHOLOGY OF VOICE. H. STERN, Monatschr. f. Ohrenh. **65**:691 (June) 1931.

Stern makes a rejoinder to Weiss' criticism (*Monatschr. f. Ohrenh.* **65**:430, 1931) of his remarks on Weiss' article "Several Stroboscopic Phenomena," both of which appeared in the *Monatsschrift für Ohrenheilkunde* (**65**:158 and 165, 1931). He states that in many cases in which laryngoscopy revealed unilateral processes such as laryngitis, tuberculous processes, neoplasms and changes of the vocal cord resulting from operations, and in which the motility seemed not impaired, stroboscopy revealed either complete immovability or a considerable numerical reduction of the movements of the diseased vocal cord. Either this stroboscopic phenomenon is limited to certain tones or it involves the entire range (testable by stroboscopy) of the voice. A comparison of the results of laryngoscopy and of stroboscopy led the author to the following conclusions: Laryngoscopy informs us only in regard to the greater movability of the vocal cord, and this in turn is dependent on the gliding capacity of the arytenoid cartilage, on the functional capacity of the adductors and abductors and on the functional capacity of the nerve that innervates the muscles. Stroboscopy, on the other hand, which may be designated as the microscopy of laryngoscopy, shows what happens in the vocal cords themselves. It reveals small processes not detectable by mere laryngoscopy, especially the swinging capacity of the vocal cords, which in turn is determined by the condition of the tissues of the vocal cords and by their specific gravity, the latter being considerably increased by inflammations, infiltrates and neoplasms. The swinging capacity of the vocal cords is also determined by the tension, the elasticity and the (geometric) form of the vocal cords, and finally by the expiratory pressure. Considering these differences between laryngoscopy and stroboscopy, it is understandable that the results of the two are not always the same and that it is determined by the type of the disease process whether the changes are better perceptible by laryngoscopy or by stroboscopy. In the last part of the article, the author stresses that neither negation of the significance of stroboscopy, nor the opposite attitude, namely, that with stroboscopy all problems of the voice can be investigated, is conducive to an advancement in stroboscopy. He thinks that stroboscopy is of value not only for phoniatrics, but, if further perfected, also for laryngology.

EDITOR'S ABSTRACT.

CLINICAL ASPECTS AND PATHOGENESIS OF LARYNGEAL CHONDRITIS. H. RICHTER, Ztschr. f. Laryng., Rhin. (teil 1: Folia oto-laryng.) **20**:141 (Jan.) 1931.

Richter first directs attention to the difficulties in the diagnosis of laryngeal perichondritis and chondritis and then mentions several etiologic factors. He further gives three case histories and discusses the peculiarities of each case. The factors to be considered in patients with similar complaints are summed up as follows: 1. In the anamnesis one should consider the possibility of former corrosion in the region of the hypopharynx and of the esophagus, for they often lead to perichondritic processes in the posterior wall of the larynx. 2. Apparently harmless swallowing of foreign bodies may cause a serious inflammation of the laryngeal cartilage, even when the foreign body is no longer demonstrable. In case of traumatic hematomas, which impair the function of the larynx, the possibility of a perichondritis should be considered. 4. An important symptom of peri-

chondritis is also the intermittent character of the disturbance. 5. The clinical aspects are extremely varied. The direct methods of examination should always be employed. 6. A fixation of the vocal cord concurring with an inflammation of the laryngeal mucous membrane is always indicative of a perichondritic process on the posterior wall of the larynx. 7. The prognosis differs in the individual cases and is primarily dependent on the timely surgical intervention. 8. The operative therapy aims primarily to secure free respiratory action (tracheotomy). If the inflammation and suppuration are localized primarily on the anterior surface and on both sides, the inferior tracheotomy is the method of choice. 9. The removal of those portions of cartilage that have undergone changes as the result of the inflammation is most effectively done in the interior of the larynx, so that the interior perichondrium of the larynx is preserved. By this, cicatricial formations can be avoided.

EDITOR'S ABSTRACT.

EXPERIENCES WITH LIGHT THERAPY IN THE EAR, NOSE AND THROAT CLINIC OF THE CHARITÉ. OSTERWALD, Ztschr. f. Laryng., Rhin. (teil 1: Folia otolaryng.) **21**:38 (June) 1931.

Before discussing the therapeutic application of light, Osterwald classifies the various types of rays and the sources of the therapeutic rays, especially the carbon arc lamp, the quartz-mercury lamp and a lamp that is intermediate between those two. He deplores the fact that indiscriminate use by lay persons and also by some practitioners has brought light therapy into discredit. He further describes the method that he has employed in patients with laryngeal tuberculosis. The first step is to determine whether the patient has pulmonary tuberculosis. If the lungs are affected, great precaution is necessary, for a slight overdosage may have undesirable consequences. In order to avoid irritation of the skin, it is advisable to test the skin reaction, by means of an instrument that is divided into five compartments. The first section is permeable for 100 per cent of the rays and the others for decreasing amounts down to 20 per cent. The irradiation is applied for from five to ten minutes, and on the following day a graduated erythema is visible. In patients with tuberculosis, about one tenth of the barely perceptible erythema dose is applied at the first session. After that the irradiation time is either continued in the same manner or is gradually increased, depending on the results of the control tests of the weight, the temperature, the pulmonary condition, the local reaction and the blood picture. As a result of this treatment, some of the complaints, such as pain in swallowing and hoarseness, disappeared rapidly. Pigment formation, which is usually a reaction to an excessive dose of irradiation, was avoided as much as possible. The temperature, the sedimentation speed of the erythrocytes and the blood picture were also favorably influenced in many cases. Nevertheless, the author does not consider light therapy as sufficient in itself, so that it would make local treatments superfluous, but he thinks that it is an effective stimulation. In conclusion he states that for patients with laryngeal disorders ambulatory treatment is not satisfactory and hospitalization is necessary.

EDITOR'S ABSTRACT.

Nose

THE IMPORTANCE OF DIAGNOSING AND TREATING SINUSITIS IN INFANTS AND CHILDREN. B. C. MARANTZ, Arch. Pediat. **48**:365 (June) 1931.

The author believes that infants are "just as frequently victims" of sinusitis as are older children. He deplores the lack of emphasis given to this phase of sinusitis, and is astonished that most texts ignore it or, at the most, give it bare mention. The article contains a description of the anatomy of the sinuses and discusses the diagnosis from the standpoint of symptoms and signs. Complications and sequelae of sinus infection as it occurs in infants and children are discussed, as is the treatment.

WADDELL, University, Va. [AM. J. DIS. CHILD.]

SINUS DISEASE OF CHILDHOOD. JOHN G. MCLAURIN, Dallas M. J. **17**:44 (April) 1931.

The author discusses the anatomic differences in children versus those in adults as regards the treatment for sinus disease. He emphasizes the clinical significance of the maxillary antrums and ethmoid cells from birth, and minimizes the importance of the frontal and sphenoid cells. A syndrome interesting to the pediatrician is considered, viz., otitis media and mastoiditis associated with enteritis, marked dehydration and a dark prognosis. The way in which tonsillectomy may be partially responsible for sinusitis in young children is ably discussed and impresses one with the necessity for well balanced judgment in recommending the removal of tonsils. The author states that the allergic conditions in childhood that may be traced to sinus involvement are frequently relieved by simple antral drainage and ventilation, together with proper adjustment of the vitamin ingestion, the latter being a problem for the pediatrician. Treatment for the acute and chronic forms of sinusitis is carefully described, including the type of environment, clothing and food, and indications for surgical intervention.

SMITH, Dallas, Texas [AM. J. DIS. CHILD.].

DISEASES OF THE NASAL ACCESSORY SINUSES IN CHILDREN. D. D. MARTIN and J. C. DICKINSON, South. M. J. **24**:659 (Aug.) 1931.

The authors believe that sinus involvements occur in practically all acute infections of the upper respiratory tract. If these conditions are allowed to go unrecognized and untreated, they frequently result in chronic conditions. Chronic sinus infections are frequently responsible for chronic infections of the chest, digestive disturbances and certain cases of malnutrition. The pediatrician, rhinologist and roentgenologist must all cooperate in the successful treatment of these patients.

SCHLUTZ, Chicago [AM. J. DIS. CHILD.].

GENUINE OZENA AS AVITAMINOSIS. A. GLASSCHEIB, Monatschr. f. Ohrenh. **65**: 289 (March), 400 (April), 587 (May) and 676 (June) 1931.

Glasscheib published this article in four instalments, beginning in the March issue. In the introduction he differentiates genuine ozena from the other forms, namely, from the syphilitic type that concurs with sequestration of the bone and with degeneration, and from the secondary ozena that develops following diseases of the accessory cavities and following their surgical treatment. Genuine ozena is that form characterized by: atrophy of the mucous membrane of the nose, the pharynx and the conchae, and also by fetor and crust formation. The author further describes the histologic aspects of ozena and then evaluates the various theories of pathogenesis. In discussing the infectious pathogenesis, he points out that the micro-organisms most commonly considered as the cause of ozena are: Bacterium ozaenae, Coccobacillus fœtidus-ozaenae Perez, Bacillus proteus, Corynebacterium Löffler, pseudodiphtheria bacilli and the ultravirus of Nasso and Tassi. Of the infectious diseases that may cause ozena, the author mentions syphilis and tuberculosis. In concluding the discussion on the infectious theory of pathogenesis, he points out that it explains all the main symptoms except the crust formation. It also does not explain, except in the cases of diphtheria and congenital syphilis, the occurrence in the prepuberal age, the preponderance in the female sex, the epithelial metaplasia, and the frequent occurrence among the poorer population. The trophoneurotic theory of pathogenesis of ozena, the author considers as incomplete. Ozena as a sympathico-endocrinous disturbance is considered primarily due to hypotonia of the sympathicus, which in turn is caused by a deficiency in the sympathicotropic substances of the endocrine glands. This theory of pathogenesis explains only some of the aspects of ozena. The author further discusses the theory that considers ozena as an aspect of a disturbance of the autonomic nervous system, also the constitutional theory and finally the so-called conchae theory. The last named theory of pathogenesis, which was advanced by

Siebenmann, points out that the majority of patients with ozena are broad-faced with broad noses, and from this he infers that the abnormal structure of the nose is the cause of ozena. The theory that avitaminosis is the cause of genuine ozena, the author discusses in detail. He describes animal experiments on A and D avitaminosis and the resulting changes that were observed first while the animals were still alive; then he describes the histopathology of the various organs, especially of the organs of internal secretion. In observations on patients, it was found that not always all the endocrine glands are involved but that there are three main types: the hypophyseal, the thyroidal and the ovarian types. The author thinks that ozena may be caused by an A and D avitaminosis during the prenatal stage, namely, when the diet of the mother does not contain sufficient quantities of the vitamins A and D. For this reason, adequate amounts of butter, milk and eggs should be eaten by the pregnant woman, for vegetables alone do not provide sufficient amounts of these vitamins. The theory of avitaminosis does not contradict the infectious pathogenesis in that an A avitaminosis creates a predisposition for infections. When the avitaminotic etiology of ozena is taken into consideration, its therapy is comparatively simple. After it has been detected which endocrine glands are involved, suitable endocrine preparations are administered, and, in addition to this, the vitamins A and D are given. Most surgical treatments are based on the theory that ozena is a local disturbance rather than a systemic disease. The author thinks that some surgical methods are helpful in secondary ozena but not in genuine ozena. He also points out that in cases of secondary ozena irradiation therapy, either with roentgen rays, with radium or with the quartz lamp, is helpful. At the end of the last instalment of the article an extensive bibliography is given.

EDITOR'S ABSTRACT.

Miscellaneous

FOREIGN BODY IN THE ESOPHAGUS FOR THREE YEARS. A. LINCOLN BROWN, California & West. Med. **34**:371 (May) 1931.

The case reported is that of a boy of 3 years who at the age of 3 months swallowed a small metal ring. Intermittent attacks of coughing followed for the next three years, accompanied by difficulty in the taking of bulky foods, and ending in refusal to eat, with loss of weight, weakness and irritability. Roentgen examination revealed the shadow of a foreign body in the region of the esophagus at the sternal level, with widening of the mediastinal shadow. Under anesthesia and with the esophagoscope, a corroded metal ring was found partially embedded in hypertrophied mucous membrane. This was removed, and the postoperative course was uneventful. The mediastinal shadows were diminished in intensity about one week after the removal of the foreign body.

DICKEY, San Francisco [AM. J. DIS. CHILD.].

ETIOLOGY OF COMMON COLD. P. H. LONG, J. A. DOULL, J. M. BOURN and E. MCCOMB, J. Exper. Med. **53**:447, 1931.

Experimental infections of the upper respiratory tract similar to "common colds" were transmitted singly and in series through two and four passages in nine of fifteen persons, by intranasal inoculations with bacteria-free filtrates of nasopharyngeal washings obtained from persons ill with natural "colds." These observations conform with those reported by previous workers and lend further support to the view that the incitant of the "common cold" is a filtrable virus.

AUTHORS' SUMMARY.

A BACTERIOLOGICAL STUDY OF "COLDS" ON AN ISOLATED TROPICAL ISLAND. D. F. MILAM and W. G. SMILLIE, J. Exper. Med. **53**:733, 1931.

Studies in the Virgin Islands, Labrador and Alabama suggest that colds are incited by some specific agent with which investigators are not yet familiar. These

studies suggest also that the secondary and more severe symptoms associated with colds may be due to certain aerobic flora commonly found in the nasopharynx. Types of pneumococci that are virulent (in white mice) and true Pfeiffer's bacilli requiring both V and X substance (and forming indol?) seem to be of particular importance in these secondary infections. The studies indicate that the specific agent that initiates colds is infectious, and is spread by direct contact, with an incubation period of from one to three days. There is strong evidence that environmental factors, particularly reduction in atmospheric temperature, have some influence on the incidence of colds.

AUTHORS' SUMMARY.

CERTAIN REFLEXES, ESPECIALLY THE OCULOCARDIAC REFLEX, AND PROVOKED NYSTAGMUS IN A CASE OF PATHOLOGIC SLEEP. J.-A. BARRÉ, METZGER and KUHLMANN, Rev. d'oto-neuro-opht. **8**:747 (Dec.) 1930.

The various types of toxins, perhaps each toxin or even each dose, may cause varied clinical pictures, in which certain reflexes are markedly affected and others are not. Few researches have been made on the effects of intoxications in man. The text for this article is the case of a woman, aged 20, who was brought to the hospital in an unconscious condition, having swallowed a large dose of a derivative of allyl-isopropyl barbituric acid a few hours previously. The neck was slightly stiff. The pupils were equal and dilated, and they reacted to light. Firm pressure on the globe for three fourths of a minute caused no slowing of the pulse, but ten seconds later the rate rose from 80 to 115 per minute, and the patient vomited. At this time the corneal reflex was temporarily present. All cutaneous and tendon reflexes were normal and lively. The eyes were immobile and looked straight forward. The ears were irrigated with water at 27 C. After 100 cc. in the right ear there was a slow movement of the eyes to the right palpebral angle, where they remained until the irrigation was stopped and then returned slowly to the central position. After 70 cc. had been syringed into the left ear, the eyes slowly turned to the left angle and remained there one hundred and ten seconds after cessation of the flow and then returned to the central position.

Thirty hours after the poisoning, signs of returning consciousness began to appear and all the reflexes returned to normal, including the oculocardiac, but there was no change in the vestibular reactions. In the galvanic test, the thresholds were equal on the two sides; with 1.5 milliamperes there was a slow displacement of the eyes toward the positive pole. Six hours later, slight nystagmus was produced by the current, but there was no nystagmus from caloric stimulation until the third day. At this time, during irrigation of the ear, when the patient attempted to look to the left, the right eye did not pass the median line. Recovery was complete on the sixth day; nystagmus occurred after 25 cc. of water had been injected; rotation produced nystagmus, lasting twenty-five seconds, and the threshold for the galvanic current was 0.5 milliampere.

It is interesting that the tendon and cutaneous reflexes were present while certain bulbar reflexes were markedly modified. The oculocardiac reflex pathway is by way of the sympathetic and vagus nerves. The effect produced by the test in this case is thought to be the expression of a sympathetic reaction (sympathetico-sympathetic), the sympatheticovagal being abolished, and the pupillary modifications tend to confirm this idea. To be noted in the vestibular reactions are: (*a*) elevation of the thresholds of reaction; (*b*) lack of conformity in the thresholds for the caloric and galvanic reactions; (*c*) replacement of the slow component of nystagmus by a very slow movement and the lack of the quick phase, and (*d*) disturbance of associated ocular movements during vestibular stimulation. "The disappearance of the rapid phase appears to be a test of sensibility great enough to indicate the degree of intoxication." Study of the effects of other poisons on the reflexes will probably show a symptom complex peculiar to each poison.

In the discussion of this paper, deNo made the point that, while the cerebral cortex and the thalamus were not necessary for the production of the quick phase of nystagmus, there is a point in the cerebral stem where the regulating system for ocular movements is joined by the oculomotor nuclei; if this point is

destroyed, the rapid component of nystagmus is lost. He also referred to the fact that in rabbits under ether narcosis the toxic reflexes on the eyes first disappear; then, when the corneal reflex is gone, the quick component of nystagmus is lost also and it is only under very deep narcosis that the slow phase of nystagmus is abolished—a chain of events like that in the case reported.

DENNIS, Colorado Springs, Colo. [ARCH. NEUROL.].

HAY FEVER TREATMENT AND THE NATURE OF POLLEN ALLERGENS. C. R. GRIEBEL, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:54 (June 6) 1931.

Griebel considers desensitization as the method of choice in the treatment for hay fever. However, since his experiences with the commercially obtainable pollen extracts were not satisfactory, he prepared his own extracts, and with these he obtained satisfactory results in diagnosis as well as in treatment. He warns against subcutaneous injections and recommends intracutaneous injections. In the second part of the article he reports his investigations on the nature of allergens. He concludes that they are a substance similar to protein. It was also found that the allergen is found in the entire green plant, however, only in small quantities and only during the time of flowering.

EDITOR'S ABSTRACT.

PERFORATING BULLET WOUND OF THE FRONTAL PORTION OF THE BRAIN WITH INVOLVEMENT OF THE FRONTAL SINUS CURED BY OPERATIVE TREATMENT. O. Voss, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **129**:69 (June 6) 1931.

Voss reports the case of a man who was brought to the clinic with a perforating bullet wound of the head. The bullet had entered on the right side immediately above the orbit and had come out on the left side somewhat beyond and above the palpebral fissure. Several days after the surgical treatment of the wounds, stiffness of the neck developed, and a spinal puncture was done by which 40 cc. of hemorrhagic cerebrospinal fluid was removed. When fever set in, the wounds were opened again, and a discharge from them indicated involvement of the frontal sinuses; when a thorough examination had corroborated this assumption, suitable treatment was instituted. In the course of recovery the patient showed mental disturbances. However, after several months' sojourn in a sanatorium he recovered to such a degree that he could resume his work. An examination four years later revealed no psychic disturbances. The physical examination showed large bone defects. There were no spontaneous nystagmus and no tendency to fall when the eyes were closed, but there was past pointing, more marked on the right side than on the left. Cold and warm irrigations and galvanization of various portions of the forehead and of the neck showed in most tests a more marked, and in some tests diverse, past pointing, and in some tests also nystagmus and movement of the head. On the outcome of these tests the author bases conclusions about the destruction of cerebral tissues caused by the injury and also about the degree of regeneration.

EDITOR'S ABSTRACT.

THE TREATMENT OF ALLERGIC DISEASES BY MEANS OF ALCOHOL INJECTIONS. LEICHSENRING, Ztschr. f. Hals-, Nasen- u. Ohrenh. **28**:220 (May 26) 1931.

Referring to a recent report by Wassermann on the treatment for hay fever and for vasomotor rhinitis by means of injections of alcohol, Leichsenring states that he has employed this treatment since the beginning of the third decade of this century. He was induced to try the method by Wagner's suggestion to treat patients for hay fever by extirpation of the nasal nerves. Since he considered the technic of the extirpation of the nasal nerves as too difficult, he attempted exclusion by means of injections of alcohol. At first he used an 80 per cent solution of alcohol to which he added some procaine hydrochloride. In order to exclude the two branches of the ethmoidal nerve, he made the injections into the middle nasal concha. He soon noted that it was not necessary to strike the nerve itself, but merely to infiltrate the region. However, when given in this

form the injections of alcohol had undesirable secondary effects. To overcome this difficulty, he changed the site of injections to the lower concha and used a less concentrated solution of alcohol (from 40 to 60 per cent). The total amount of the injected fluid was generally from 1 to 2 cc. for both sides. The injection was preceded by cocainization. In regard to the efficacy of the treatment, it is stated that in vasomotor rhinitis and in hay fever it is successful in about 80 per cent of the cases. However, the result is not permanent, for in patients with hay fever the injections have to be repeated every year. How long it is effective in vasomotor rhinitis the author is not able to state. In the last part of the article he points out that when the treatment was employed in patients with vasomotor rhinitis who also had asthma, the asthma likewise disappeared. In other cases of asthma the treatment failed, and in some it was temporarily effective.

EDITOR'S ABSTRACT.

HISTOPATHOLOGIC INVESTIGATIONS ON MENINGITIS WITH THE EXCEPTION OF EPIDEMIC MENINGITIS. JUNG and SILBERBERG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **28**:251 (May 26) 1931.

In order to study the course of meningitis, Jung and Silberberg performed experiments on animals. They found that in acute inflammation the capillaries and veins are engorged, and leukocytes, lymphocytes and monocytes pass through the vascular wall. This migration of cells reaches its maximum after eight hours. Some of the blood lymph cells undergo changes within the vascular channel, in that the protoplasm hypertrophies. After their migration into the perivascular tissues the hypertrophy progresses. After from eight to twenty-four hours, nuclear changes and the development of polyblasts can be observed. During the first two days the polyblasts can be differentiated from the resting migratory cells of the tissues. Then the latter also become mobilized and likewise wander to the region of inflammation. The lymph cellular and histogenous polyblasts act as macrophages. From two to four days later there is an increased formation of polyblasts, which, in regard to their origin, can no longer be differentiated. The leukocytes of the exudates commence to disintegrate. Between the fifth and the eighth day there begins a transformation of the exudate macrophages to fibrocytes. The leukocytes are changed by the macrophages, and in this stage the leukocytes have nearly all disappeared. In the later stage the formation of fibroblasts, from which the scar is formed, becomes more marked. If there is a healing tendency there is frequently a renewed cell migration from the blood shortly before the reactive processes cease. In chronic inflammation the granulation tissues frequently contain lymphocyte infiltrates, the so-called "small cellular infiltration." That the vessels participate in the processes of organization, in that the angioblasts form new capillaries, is self-evident. Cell-forming activity of the vascular endothelium was not observed. The authors think that on the basis of the aforementioned symptoms the age of an inflammatory process can be determined; however, the requirement for such an estimate is a careful technic. They found Maximow's hematoxylin-azure II eosin stain most satisfactory for materials that had been fixed with Zenker's solution and embedded in celloidin. In conclusion they recommend that further studies should be made on those forms of meningitis that end fatally within several hours.

EDITOR'S ABSTRACT.

THROMBOSIS AND EMBOLISM. A. BLOHMKE, Ztschr. f. Laryng., Rhin. (teil 1: Folia oto-laryng.) **20**:123 (Jan.) 1931.

Blohmke points out that in spite of the fact that fatal embolisms are rare in otological practice, otologists should nevertheless report their experiences on the problem of thrombo-embolism, which in recent times has been much discussed and investigated in the various branches of medical science. The form of thrombosis that is most frequently observed by otologists is sinus thrombosis. Otologists should participate in the investigations on thrombosis and embolisms, not only because they may gain new insight into certain aspects of their own specialty, but

also because an adaptation of their procedure of ligation of the jugular vein in sinus thrombosis has been recognized as effective in other forms of thrombosis and embolism, such as in mesenteric and puerperal pyemia, and now prophylactic ligations are also recommended in pulmonary embolism. The otologist is primarily interested in the infectious toxic forms of thrombosis. Otogenous infectious systemic diseases may, in rare cases, develop without sinus involvement; however, an otogenous septicopyemia practically cannot be differentiated from a sinus thrombosis, particularly not from a thrombosis of the sinus transversus sigmoideus or from a thrombosis of the bulbus venae jugularis. On these cerebral vessels thrombosis is primarily observed, and the other sinuses of the petrosa generally become only secondarily involved. The author further discusses the pathogenesis of sinus thrombosis. He estimates the etiologic significance of the changes in the blood, which are caused by bacteriemia, of the histologic changes in the wall of the sinus and of the shape of the sinus. Further, the various types of thrombi, their progress and their treatments are discussed.

EDITOR'S ABSTRACT.

AMNESIC PARTICULARLY SO-CALLED OPTIC APHASIA. H. DAHMANN, Ztschr. f. Laryng., Rhin. (Folia oto-laryng.) **20**:188 (Jan.) 1931.

Dahmann states that the forms of aphasia most frequently caused by otogenous abscesses of the temporal lobe are the sensory form and the so-called optic form, both of which are subdivisions of amnesic aphasia. The author thinks that the term sensory aphasia is mostly self-explanatory; however, the term optic aphasia as one manifestation of amnesic aphasia involves more complicated abolitions of functions, and it is therefore difficult to obtain an objective picture of this condition. It is difficult to determine whether and to what exent, besides the speech, the thinking process and the power of utterance are involved, for the disturbances in the vocal expression, which are perceptible to the examiner, do not always go parallel with the abolition of the internal speaking process. In order to be able to differentiate between the reduced capability of expression and the retained capabilities of internal speech processes, the physician is largely dependent on the statements of the patient. Of course, it requires a certain degree of intelligence on the part of the patient to express the difference between the preserved internal and the disturbed external capacity of speech. The author reports the case of a patient in whom intelligence, condition of consciousness and concentration capacity permitted a careful study. The various association processes were tested, namely: (1) primary acoustic perception and word sound remanence, (2) optic remanence and word sound remanence, (3) tactile remanence and word sound remanence, (4) gustatory remanence and word sound remanence, (5) olfactory remanence and word sound remanence and (6) remanence of abstract ideas and word sound remanence. The author describes the results of these tests and comes to the conclusion that a disturbance in the cortical or subcortical fibers that directly connect the sense remanences must cause a disturbance in the coordination and in the quantitative functional capacity of the senses according to the degree of tissue disintegration, irrespective of the intact functioning of the leading instance. However, a disturbance of the association between the remanences and the regulating instance (double-barreled thalamocortical channels) eliminates the cooperation of the regulating component and thus disturbs the ingenious cooperation of the remanences of the conceptions, and they form disordered and nonsensical combinations. The author thinks that the term "optic" aphasia is an unsuccessful selection, because from this term one could assume that a disturbance in the optic component is the causal factor in this type of aphasia. However, this is not the case; only the direct connection between the optic and the acoustic functional centers is disturbed. For this reason the author suggests the term "amnesic aphasia of the type of the optic-acoustic conduction disturbance," and shows the advantages of this term over the former one.

EDITOR'S ABSTRACT.

Society Transactions

AMERICAN LARYNGOLOGICAL ASSOCIATION

CHARLES J. IMPERATORI, M.D., *Abstract Editor*

Fifty-Third Annual Congress, June 15, 16 and 17, 1931

FRANCIS R. PACKARD, M.D., *President, in the Chair*

PRESIDENTIAL ADDRESS. DR. FRANCIS R. PACKARD, Philadelphia.

After referring briefly to the deaths of Dr. Ross Hall Skillern and Dr. Clyde Lynch, Dr. Packard explained why the Association was holding its meeting at Atlantic City rather than in conjunction with the American Otological Society at Briarcliffe. The latter Society found that it was necessary to meet at Briarcliffe because of the proximity of the laboratories in which Sir Charles Balance and Dr. Duel had been carrying out their experiments on otologic neural surgery. He said he hoped that the custom of having the two societies meet together will be resumed and continued in the future.

The body of Dr. Packard's address was concerned with a number of unsolved laryngologic problems which he contrasted with some of those that have been solved. In the latter connection he pointed out the tremendous improvement in the technic and appliances used in diagnosis and treatment, beginning with some of the numerous appliances of electricity and showing how the use of electricity for illumination, etc., had rendered possible the bronchoscope, the esophagoscope and many other technical advantages.

Certain pathologic conditions still baffle the rhinologist, such as ozena and chronic vasomotor rhinitis, although much progress has been made. The bright side of this work is shown in the wonderful progress in the diagnosis and treatment of sinus infections, in the management of tuberculous lesions of the larynx and malignant growths of that region, and in the aid that the bronchoscope and esophagoscope afford in laryngeal and esophageal conditions. The crude methods employed in the diagnosis and removal of foreign bodies in the upper respiratory or the digestive tract were contrasted with the facility with which such conditions can now be met.

After referring to the pioneer work of Thomas R. French in photography of the larynx, Dr. Packard called attention to the fact that moving pictures of the larynx were to be shown at this meeting.

THE EXAMINATION OF LIVING CELLS. DR. HARRIS P. MOSHER, Boston.

Observations on thirty-five consecutive specimens mostly of antral mucous membrane, removed at operation in cases of chronic suppurative maxillary sinusitis, were reported. Living cilia were found in every specimen.

DISCUSSION

DR. HENRY L. SWAIN, New Haven, Conn.: To one who works with a microscope, the small processes that take place are wonderfully interesting, because, as Dr. Mosher said, back of all of these lie the problems of pathology and the beginning of infection and its progress.

The next point that came to me was the fact that living cilia were found in every specimen. Two things came to my mind immediately: (1) Does regeneration take place? I hope that in his closing remarks Dr. Mosher will tell us whether he observed any specimen from a case in which operation was performed to see if the ciliated epithelium was restored in the interior of the sinus. (2) If

cilia are present even in a chronic condition, should we rush in and destroy every bit of mucous membrane in a sinus in our surgical intervention and thus take away by mechanical means cilia that would, if given time, regenerate?

Dr. Lee Wallace Dean, St. Louis: We have been interested in the study of living ciliated cells. We have used tissue culture, keeping cells from the maxillary sinuses alive for a number of days. The ciliated cells, like the special cells of the central nervous system, do not regenerate. Dr. Swain mentioned the process of regeneration. Ciliated cells, once injured, become useless. If there are to be new ciliated cells, regenerated cells, they must come from other undeveloped cells; that is, as the adult cell is so specialized, it will not regenerate.

Again we have suspended pinhead-sized masses of cells in drops of fluid in order to study the cells under the microscope. These small accumulations of ciliated cells in droplets have been subjected to the action of the calcium ions, the sodium ions and the potassium ions. The calcium ions have had the opposite effect of the sodium and potassium ions so far as the activity of the cilia is concerned.

The unicellular and multicellular marine organisms with very large cilia are the only ones that we have been able to study in their normal habitat. The movement of the cilia, the influence of mechanical stimulation on the cilia and the effect of the stimulation of certain cells bearing cilia on the adjacent cells can be studied in this type of organism. Resting of the cilia was brought to our attention by studying first the marine forms. Cilia do not beat all the time. The ciliated cells rest in groups; then, after a while, they start hitting and lashing, and other groups rest.

In these marine forms of life, it was easy to study the motile bodies in the ciliated cell. These are refractive bodies in the end of the cell adjacent to the cilia and have been proved to be intimately connected with the activity of the cilia processes. In the multicellular marine form, the independence of ciliary action, to the central nervous system has been demonstrated. In no living thing, so far as I know, has the connection between a nerve fiber been traced to a ciliated cell. In these multinuclear marine forms, as in the snail, if a group of ciliated cells is stimulated, the ciliated cells in the neighborhood that are not touched or stimulated are set in motion. Theoretically, it has been suggested that the central nervous system may bring about activity of the ciliated cell, not by having direct contact of nerve fiber with the cell but by producing chemical changes in the medium in which the cell lives, similar to the chemical changes that are artificially produced and have such a marked action on the ciliated cell. That, however, is purely a hypothetic thought.

The study of these living cells introduces many problems. For instance, until we began our work, I had no thought that there was not an accurate method of measuring the activity of the cilia. There is no such method.

It is, of course, obvious that any traumatism of an organ, which interfered with our work, immediately interferes with the conductivity of the cell wall. It is obvious that when we open a maxillary sinus, the cells in that sinus are subjected to conditions that are not normal, and we do not study normal cells. When we transfer a living cell to another medium, it makes no difference how near this medium approaches the condition of the habitat of the cell, we are introducing an element into the experiment that precludes observation being made on perfectly normal cells. The activity of these cells in droplets, in tissue culture or in any medium except their normal habitat is no longer physiologic.

Dr. Burt R. Shurly, Detroit: Dr. Mosher has opened up a wonderful and most fascinating and interesting study of what are truly the locked up mysteries of life, which have baffled all scientists for many years. The combination that he gave of the living cell under the action of atropine and of pilocarpine brings up, of course, the question of the direct physiologic action of these drugs in regulating the vasomotor and vasoconstrictor mechanism that has to do with that blood supply, and in this we have, of course, the true underlying problem as it relates to the particular biochemic arrangement of things within the cell. There are the experiments on the carrier pigeon. If you take cross-sections of the giant cells

in the spinal cord under conditions of great fatigue after long flights, and those of the controls during the resting period, it is easy to observe under the microscope that the protoplasmic content of the cell, the fine granulation with its supply of the essential food products, has been completely used up under conditions of flight, whereas during the resting period the giant cells are filled with granules of protoplasm. In other words, the sal ammoniac of the battery is present, under one condition, when we ring the bell electrically, and under the other condition, the sal ammoniac of the battery is gone and the bell no longer rings.

In our laboratory, we have carried out some exceedingly interesting experiments in connection with the cells so far as the problems of diet deficiencies are concerned and the biochemistry connected therewith. We have noted that in white rats that we put on a diet deficient in vitamin A the first change that it is possible to detect at the end of from twenty-eight to thirty-five days is a cornification of the vaginal epithelium. In this we have the first detection of a biochemical change that is taking place, and with it we have the beginning of the changes that carry with them certain special varieties of infection in the nasal passages, and, as you know, the ultimate process of ophthalmia with corneal ulceration, drying of the lacrimal apparatus and respiratory infection, as it takes place in the nasal passages and down through the respiratory tract, with the ulceration that takes place at the base of the tongue. These very early findings are exemplified in the cornification of the epithelial cells, and a complete change takes place during the menstrual circle of the white rat.

I believe that in the problem of the living cell, the question of food supply, biochemistry and electrode potentiality must be understood more thoroughly, and that together with all our other contributions some day we shall be able to put all the facts together and to understand things more thoroughly.

Dr. Arthur W. Proetz, St. Louis: In the study of unstained tissue, we open immediately a new problem of illumination. Contrasts with which we have been familiar in stained tissue no longer exist, and new contrasts arise. These tissues are highly refractile. I would like to ask Dr. Mosher whether he has used any special lighting arrangement in getting these pictures, which show considerable contrast, and especially whether he has had any experience with polarized light, or whether anyone else here has. It is difficult to work with, but it may be necessary, because we often have false contrasts that are merely the result of refraction and not of actual structural differences in the cells.

Observations and Correction of Various Types of Congenital Atresia of One or Both Nasal Passages and Certain Apparently Related Lesions. Dr. Vilray P. Blair, St. Louis.

Congenitally, the nasal passages and all accessory sinuses that normally communicate with these passages may be totally absent; however, the nasopharynx may otherwise be normal. There may be a bony or a soft tissue atresia on one side at the anterior naris, with the absence of half the external nose. There may be a bony atresia on one side at the posterior naris, or a pinching out of the passage some place between the two nares. The passages may be obstructed by a nondescent of the part of the frontal process that carries the premaxilla, and there is apt to be obstruction of the breathing space in the true case of bifid nose. In each of these, differently planned reconstructive surgical procedures are required to restore the breathing space, and within certain age limits and with due regard to the state of health, the earlier these operations are completed, the better for the patient.

DISCUSSION

Dr. Lee W. Dean, St. Louis: I was interested in the patient with the complete, bilateral, bony atresia of the nose from the standpoint of physiology. In one x-ray picture there was no evidence of a nasal sinus. In the other x-ray plate, the nasal space and the space of the nasal sinus seemed to be occupied by a cancellous bone. At the time of the operation, Dr. Blair furnished me with all the

bone that was removed; it was cancellous. The nasopharynx was quite normal, with complete obstruction of the nose. The hearing was normal.

Naturally, the interesting problem that came to my mind when I saw Dr. Blair's patient was of the opportunity to tell exactly the difference between taste and smell.

Dr. Arthur W. Proetz, St. Louis: As Dr. Blair told you, this patient had, so far as we could tell, no olfactory apparatus; he had a nasal pharynx, and the rest was simply cancellous bone. This boy could differentiate things that, according to our previous conception, must ordinarily be differentiated by the olfactory apparatus. He could differentiate things besides the salt, sweet, bitter and sour that are supposed to be differentiated with the tongue. In other words, the gustatory odors are probably in the pharynx, at least they were in this boy, and not merely confined to the olfactory apparatus.

Dr. Gordon B. New, Rochester, Minn.: The point Dr. Blair stressed was a question of lining. I think that in years gone by that constituted the failure in many plastic cases; that is, the surgeon did not realize that it is not the covering that is essential in order to make a nose, but rather the lining. Dr. Blair brought this out well in his pictures.

The Relationship Between Status Lymphaticus, the Thymus and the Suprarenal Glands. Dr. Edward H. Campbell, Philadelphia.

In addition to the type of status lymphaticus in which an occasional sudden death occurs, statistics mentioned show that there are milder grades of this condition commonly present which contribute to the ill health of many people. Difficulty in ascertaining the true size of the thymus was taken into consideration, and statistics on the occurrence of an enlarged thymus were mentioned.

The subject of roentgenography of the thymus was considered in some detail, doubt being expressed that it was of any value in the hands of many roentgenologists in depicting the size of the gland.

Dr. Campbell discussed the question as to whether or not roentgen treatment for an enlarged thymus preliminary to tonsillectomy is of any value.

Statistics were mentioned which showed that the enlarged thymus is only a symptom of status lymphaticus, which in turn is due to a deficiency of the suprarenal hormones.

DISCUSSION

Dr. Henry L. Swain, New Haven, Conn.: There has been much light recently thrown on the question of mere size as regards the extent of function of the thymus gland. A large thymus gland in a large child takes up more space than a small thymus gland in a small child; therefore, we have to estimate the size of the opening and the position of the gland to the opening and what it does from a mechanical standpoint.

Of course, you are all familiar with the fact that the calf has a sweetbread and a thymus gland and the cow has not, and that there must be a chance to study the comparative balance between the adrenals and the thymus of a calf and the adrenals of the grown animal when it is minus a thymus.

Dr. Harris P. Mosher, Boston: I believe that there is such a thing as status lymphaticus death.

Some years ago we had a series of calamities at the Massachusetts General Hospital. We had one death a year for four years from what appeared to be status lymphaticus, and autopsy showed the anatomic lesions of status lymphaticus. It ended up by our feeling that the detection of an enlarged thymus by the old fashioned anteroposterior plate was the only clue to a possible status lymphaticus.

We took x-ray pictures in all of our cases and found enlarged thymus glands in 7 per cent. There is a strong probability that these patients are in the status lymphaticus class. The patient is treated, and then after a time comes to operation. For ten years we have had only one death. The history of such a case, in turn, is as follows: The recording of the roentgen observations on the x-ray envelope was wrong. The thymus was suggestive. It was recorded as a normal thymus; the patient died on the operating table.

DR. D. BRYSON DELEVAN, New York: I think that probably more than twenty years ago my attention was called to the subject of status lymphaticus by the late Dr. French, who evolved a method of determining by careful observation of the patient before operation the existence of an enlarged thymus gland. I adopted that system and had all of my patients examined; in a very few cases I found the thymus enlarged, and I declined to operate.

DR. BURT R. SHURLY, Detroit: I would like to ask if Dr. Campbell can tell us something about the new hormone that was reported lately at the American Medical Association, which in its value in Addison's disease is claimed to be similar to insulin in diabetes. If it is, there might be a possibility of relief in a thymic case with proper prehormone medication, just as there is with insulin in cases of diabetes.

DR. LEE W. DEAN, St. Louis: About five years ago I had a case in which there was a so-called thymic death; at autopsy, the thymus gland was found not to be enlarged. I was concerned with this danger with our operations on the tonsils. This patient had an endocrine disturbance which should have been observed before he came to the operating table, because there were outstanding evidences of the disease. Dr. Carlson of the University of Chicago told me three things: (1) Knowing the physiology of the thymus gland as he did, he did not consider it possible to have a death from the disturbance of that gland alone; (2) its functions are so intimately wrapped up with the functions of the other endocrine glands, that there must be a disturbance of glands other than the thymus; (3) if there is a death in such a case following an operation, it is an endocrine death and not a thymic death.

Dr. Carlson did not think that a thymus gland would be enlarged sufficiently to cause death by pressure on the trachea or by other obstructive lesions. Further, he said that if the patient had the endocrine disease as he viewed it, he would die anyway from some other mild shock, and that if it happened, one should not feel badly about it.

All children are admitted to our ear, nose and throat service through the department of pediatrics, and there the endocrine cases should be recognized for us.

DR. HENRY L. SWAIN, New Haven, Conn.: The cause of Addison's disease has been considered to be the lack of a proper adjustment of the suprarenal and the cortex hormone to the needs of the system. The suggestion has been made by Dr. Campbell that when there is not enough hormone entering the system of the child, the thymus supplies it. I think that we should consider pigmentation. In cases of status lymphaticus, it is rarely noted. In Addison's disease there is marked pigmentation. Addison's disease occurs in the young adult, and not in children, as I understand it. The reason is that the thymus is still active in children and is not active in young adults, so that normal evolution takes place. Therefore, in the adult who does not have a thymus to take the place of the deficient hormone in the suprarenal gland, a more marked infection and death result from Addison's disease and the pigmentation.

DR. EDWARD H. CAMPBELL, Philadelphia: Dr. Swain, I did not mean to give the impression that the thymus was taking the part of the action of the suprarenal gland; there is a deficiency of the suprarenal cortex. I did not mean to give the impression that the thymus was balancing that secretion. The thymus, according to the latest information, is not an organ of internal secretion; it has no internal secretion; it is simply a part of the thyroid gland and acts as a storehouse for secretion from the thyroid.

You also mentioned the possible advantages of the administration of a cortex (or perhaps Dr. Shurly mentioned that) in combating status lymphaticus. Recently there has been a good deal of work done on the administration of cortex in such cases as Addison's disease; it has not been tried directly in cases that have been diagnosed as status lymphaticus, chiefly because of insufficient diagnoses of such conditions. The only way we have of diagnosing a case of status lymphaticus is by an enlarged thymus or the general lymphatic constitution. There has been a little work done on other ways of detecting the cases, chiefly because of the hypersusceptibility of patients with status lymphaticus to drugs, and the chief drug that

has been mentioned as of possible use in detection is histamine. The subjects have been found susceptible to histamine, and local injection under the skin gives a great reaction.

ADDISON'S DISEASE. DR. FREDERICK T. HILL, Waterville, Me.

Dr. Hill presented the case of a patient, aged 33, with Addison's disease, who had marked pigmentation of the tonsils.

A NEW OPERATING TABLE. DR. WILLIAM B. CHAMBERLAIN, Cleveland.

Dr. Chamberlain showed photographs of a new operating table.

CONGENITAL STENOSIS OF THE LARYNX. DR. CHARLES J. IMPERATORI, New York.

Dr. Imperatori presented a specimen from a case of congenital stenosis of the larynx.

A TRACHEOTOMY TUBE. DR. HENRY B. ORTON, Newark, N. J.

Dr. Orton presented a tracheotomy tube with obturator to be used in the decannulation of a patient.

BRONCHOSCOPIC INSTRUMENTS. DR. MERVIN C. MYERSON, New York.

A FELLOWSHIP IN OTOLARYNGOLOGY. DR. C. G. COAKLEY, New York.

Dr. Coakley announced the establishment at the Presbyterian Hospital of a fellowship in otolaryngology. The conditions are: the candidate should be a graduate in medicine of a class A college and should have had a special training in a special hospital that is approved by the committee; the fellowship is for one year with a renewal of an additional year if the work has proved promising; the income from the fellowship is $1,000, with room and board attached. The fellowship will be opened about the first of October.

MALIGNANT GRANULOMA OF THE NOSE WITH FATALITY. DR. GEORGE B. WOOD, Philadelphia.

Dr. Wood reported the case of a patient who died, after sixteen months, of neoplastic destruction. The lesion began on the nasal septum, and destroyed not only the soft tissues of the nose and surrounding parts of the face but also part of the bony structures.

MALIGNANT TUMORS OF THE NASOPHARYNX WITH INVOLVEMENT OF THE NERVOUS SYSTEM. DR. FRENCH K. HANSEL, St. Louis.

The early diagnosis of malignant tumors of the nasopharynx is often difficult on account of the small size of the primary growth and the lack of nasopharyngeal symptoms. Extranasopharyngeal symptoms, however, are commonly present in the early stages of the disease. Early signs and symptoms are often referable to the cranial nerves, causing pain in the eye, forehead, side of the face and temporal region, toothache, earache, diplopia, ophthalmoplegia, blindness, proptosis, paresthesia of the face, dysphagia, hoarseness, etc. The nasopharynx should be carefully examined, therefore, in all cases of unexplained palsy or irritation of the cranial nerves to rule out the possibility of a malignant tumor.

TUMORS OF THE PHARYNX AND TONSILS. DR. GORDON B. NEW, Rochester, Minn.

This paper consisted of three parts: (1) benign tumors, a report of 63 benign neoplasms (17.65 per cent); (2) the adenocarcinoma (mixed tumor type), a report

of 74 cases (20.68 per cent); (3) the malignant tumors, a report of 220 malignant tumors (61.6 per cent). It will be published as three separate articles in future issues of the ARCHIVES OF OTOLARYNGOLOGY.

DISCUSSION

DR. JOSEPH C. BECK, Chicago: I appreciate the material Dr. New presented. I wish to bring out the point of hopelessness in treating patients surgically for conditions in this region.

If a biopsy shows this malignant type of epithelioma, we should be satisfied with prolonging the life of the patient by good roentgen and radium therapy in the hands of experts who do this type of work, rather than by treating them ourselves. However, we do know that in spite of the prolongation of life there is another difficulty; that is, the pain that is not always relieved by irradiation. I would suggest, from my experience with patients who have the terrible pain often associated with such malignant conditions, that section of the posterior root be performed, if necessary, rather than the injection of alcohol.

The cure of patients with myeloma is very rare because the tumors metastasize into the spine, the ribs and the skull and cause intracranial complications. I wonder why the patients in the cases mentioned recovered, and those whom I have seen, who were given intense irradiation with both the x-rays and radium, had no relief and metastasis resulted.

DR. JOHN J. SHEA, Memphis: I have two cases of angioma, one a lymphangioma and the other a hemangioma, both of which arose at the posterior end of the middle turbinate; the lymphangioma penetrated through the palate.

DR. GORDON B. NEW, Rochester, Minn.: Just a word in regard to what Dr. Beck said about myelomas. Myelomas were not included in a group on a chart that showed any cures; they were listed with a group of fourteen unusual tumors, but not in a group in which there were cures. I have two patients with myelomas of different types; one is alive two years, and the other three years, following irradiation, but they are not classed as cured.

MOTION PICTURE STUDIES OF THE LARYNX. DR. CLYDE A. HEATLY, Rochester, N. Y.

Dr. Heatly discussed the usefulness of laryngeal photography, reviewed its history and presented an apparatus for obtaining full screen motion pictures of the larynx. About 250 feet of film has been selected to show (1) the normal larynx, (2) early carcinoma of the larynx, (3) laryngeal palsy and (4) tuberculous laryngitis.

DISCUSSION

DR. D. BRYSON DELEVAN, New York: This remarkable demonstration certainly presents many things, some of which we hope at least may be far in advance of anything we have had before. In looking back on the history of laryngeal photography, we find the crude and clumsy efforts of Lennox Brown, who, with an arc light and a laryngoscopic mirror in the hands of an expert singer, the only person in London he knew who could demonstrate his own larynx, threw the light into the patient's throat and with an ordinary photographic apparatus took a picture of the vocal cords, but that was as far as he went. From that time until today nothing has been done that at all compares in any respect with the work of Dr. French.

The work of Dr. French has been buried for forty-five years, and it is high time that it is brought out, because it is as good today as it ever was, and it is better than anything we have.

DR. SAMUEL MCCULLAGH, New York: I should like to ask what possibilities are held for color photography of the larynx.

DR. CLYDE A. HEATLY, Rochester, N. Y.: I believe it has been estimated that the illumination necessary for adequate color photography is between twenty-five and thirty times that of ordinary black and white photography.

LARYNGEAL VERTIGO AND ITS RELATION TO CATAPLEXY. DR. J. GORDON WILSON, Philadelphia.

Laryngeal vertigo is a sequence of abnormal symptoms or motor responses associated with the larynx. It appears under such conditions as coughing, laughing, emotional expression and, in the case presented, swallowing. In no case is vertigo present. A pathologic lesion is usually not present in the larynx.

The characteristic symptoms of laryngeal vertigo are: (1) a disturbance, sensory or motor, in or near the larynx; (2) a sudden fall to the ground from loss of power in the lower limbs; (3) the extreme brevity of the attack, followed by complete recovery.

The symptoms of laryngeal vertigo are similar to those of cataplexy, but there is no narcolepsy. The presence of consciousness in laryngeal vertigo is difficult to decide owing to the brevity of attack.

The theories offered have been: epilepsy (Gray), valsalva (Negus), disturbance of the pulmonary or cerebral circulation (McBride, Fraser and Turner) and a laryngeal paresthesia. None of these is satisfactory. An explanation is sought in the primitive laryngeal reflex.

THE ETIOLOGY AND TREATMENT OF ORBITAL INFECTION. DR. CHARLES T. PORTER, Boston.

This paper was presented (1) because of a lack of definite information in textbooks and the literature as to the cause and treatment of orbital infection, and (2) because Dr. Porter's special training in otolaryngology and ophthalmology makes for special interest in this type of disease.

The anatomic relation of the orbit and the nasal accessory sinuses is very close. Analysis of case histories shows that a great majority of these cases are of sinus origin. The treatment is divided into expectant, or conservative, and operative.

Conclusions based on studies of a long series of cases with numerous operators were presented.

DISCUSSION

DR. C. G. COAKLEY, New York: This condition is seen much more frequently in children than in adults, and the treatment is somewhat different.

Epinephrine is not very useful and is often a rather harmful drug to use in these cases. The secondary reaction often does more to block up and impede the action than to give a beneficial result.

For some time past we have been using ephedrine in place of epinephrine.

When an external incision is necessary, Dr. Porter leaves the wound open until the acute inflammatory process has subsided. I think that erysipelas developed in the cases in which we used to sew up the wound, and that more cases of meningitis developed in these cases than in those in which the wound was left open.

I was pleased to hear Dr. Porter say that in most of these cases the edema and swelling are extra-cortical. I think that that is a point that has not been realized by most of us. With careful resection and lifting up through the incision, like the lower part of the Killian incision, and being careful to lift up the periosteum without wounding the orbital contents, the results are certainly very much better.

I have not had much experience with intranasal operations on young children. If relief cannot be gotten from contraction and drainage, nasal irrigation, I think that an external operation is to be preferred to internal operations.

DR. GORDON BERRY, Worchester, Mass.: The ophthalmologist should watch the case for changes in the fundus and fixation of the muscles.

As regards the intranasal versus the extranasal operation, I am in favor of the latter.

DR. HARRIS P. MOSHER, Boston: I have summarized this whole question in my mind, and I think that these cases are not only 75 per cent cases of sinus disease, but that they are more than 75 per cent cases of disease of the ethmoid sinuses. With that in mind, my policy is to treat the patient almost entirely by the external route.

Dr. Henry L. Swain, New Haven, Conn.: As I was about the first person in the country to use epinephrine in the nose in the shape of an aqueous extract of the suprarenal glands, I have gotten so I depend on it, and I find no contra-indication in my experience in the use of epinephrine. In children, as you all know, it does not produce contraction as much as it does in the adult because the cavernous tissue has not been developed as much in the child.

Dr. J. A. Babbitt, Philadelphia: There is some question, I think, as to the route by which the infection takes place. Vale, of Cincinnati, some years ago, expressed the belief that only through a direct, actual entrance that could be found in the periosteum was there a connection through from the sinuses to the orbital cavity. Infection can creep in from the outside, but do not most of these cases occur from extension of the area and of the sphenoid and ethmoid sinuses? Hajek, I believe, quoted four routes: through dehiscence, through lymphatic absorption, through the small veins and through compact bone.

I believe that the use of epinephrine produces a reaction, especially in cases in which hemorrhage has to be controlled, which is worse than the effect of the drug at first.

I think that cases of orbital cellulitis, particularly when there is danger and a possibility of a deeper infection, invite pretty prompt treatment of the ethmoid sinus; in a number of cases in which we have performed intranasal operations, no harm has occurred.

Dr. Frederick T. Hill, Waterville, Me.: I think that it is extremely interesting to realize the small number of cases in which there is a true abscess in the orbital cavity and how often cellulitis occurs. Sometimes it seems that something more than operation on the sinuses, when involved, is necessary for children with these complications.

Dr. Edwin McGinnis, Chicago: A differential diagnosis should be made between true orbital cellulitis, due to a bacterial invasion, with inflammation, swelling and edema, and thickening without the formation of pus. In some cases cellulitis occurs, and in these the process progresses to the formation of an abscess.

As to the question of operating on the sinuses in children, I have been loathe to tamper with the ethmoid labyrinth and I have handled the cases by orbital drainage; to my surprise I have obtained a good end-result in these cases.

Postoperative Complications of the Radical Operation on the External Frontal Sinus. Dr. Harold I. Lillie, Rochester, Minn.

This article will appear in a later issue of the Archives.

DISCUSSION

Dr. Mervin C. Myerson, Brooklyn: I would like to suggest the use of tribromethanol for anesthesia, as it seems to be more simple from every standpoint.

We have made it a rule for a long time to extend the Killian incision by a vertical one. On our service we also favor the Coakley type of operation.

Dr. Cornelius G. Coakley, New York: The point that I would like to talk about is the question of anesthesia. I gather from Dr. Lillie that he now prefers intratracheal anesthesia for these cases above all others.

The intratracheal anesthesia was used in all varieties of surgical operations at the Presbyterian Hospital, but it was given up on account of the larger number of cases of pneumonia that developed after operation. The anesthesia that we prefer to use is that given by Dr. Bennett; an S-shaped tube is passed over the tongue to the entrance of the larynx. The pharynx is then packed off above this tube so that no secretion can get into the larynx. This procedure is much likened to the tracheal anesthesia as the ether reaches the entrance to the larynx, but it is not delivered within the trachea. When I am not able to get such skilled anesthesia, I much prefer rectal anesthesia.

DR. CHARLES T. PORTER, Boston: I agree heartily with Dr. Lillie, particularly on his idea of cleaning out the tonsils when they are infected before doing a radical surgical operation on the sinuses.

I would like to ask Dr. Lillie about the success in keeping the nasal frontal duct open after a radical operation on the frontal sinus, particularly the modified Killian operation.

DR. GEORGE M. COATES, Philadelphia: I have used as an anesthesia for radical operations on the frontal sinus the old ether method; and I have done a good many under local anesthesia, which has, on the whole, been quite satisfactory.

Dr. Myerson mentioned anesthesia produced by tribromethanol, and I would like to say that we have used it.

I should like to speak about the diplopia and the deformity that sometimes follows operations. In recent years, I have been using the Stiller modification of the Lothrop operation, which leaves the floor of the sinus in and yet takes away the interior wall of the sinus, giving a very free exposure. That operation cannot be used in all types of frontal sinus infection, but when it can be used, you absolutely avoid any chance of diplopia.

DR. JOHN J. SHEA, Memphis: I wish to show a few slides that illustrate the complication that may occur from a radical operation on the external frontal sinus in acute cases and especially in young people. Young children are not good risks for operations on the external frontal sinus, for the simple reason that in children the diploe is very spacious and infection may travel extensively and produce severe osteomyelitis.

DR. HAROLD I. LILLIE, Rochester, Minn.: In regard to anesthesia for radical external operation on the frontal sinus, I am glad to know of Dr. Coakley's experience at the Roosevelt Hospital. We have used that anesthesia in operations on the frontal sinus and in other operations around the head for three years with more satisfaction than we have had with any other type of anesthesia. We have used tribromethanol and other barbiturates, with the objection I mentioned, that in some cases there is a delay in recovery from the anesthesia, causing alarm not only to us but to the relatives.

THE NATURAL ORIFICE OF THE MAXILLARY SINUS: ANATOMIC STUDIES. DR. MERVIN C. MYERSON, New York.

This article will appear in a later issue of the ARCHIVES.

DISCUSSION

DR. ROBERT SONNENSCHEIN, Chicago: As we all know, the generally accepted method of irrigation of the maxillary sinus is by way of the inferior meatus, by means of a trocar.

We are aware of the fact that in many instances the ostium is so situated that it is practically impossible to enter it with any cannula. That may be true, but nevertheless we washed out by way of the middle meatus in the vast majority of cases, because if we could not get into the natural opening, we entered an accessory ostium.

We have found the method of irrigating satisfactory, because it gives much less reaction and much less pain, and the patients do not dread irrigation at future times.

We have noted that in children it has often been easier to get into the maxillary sinus by way of the middle meatus than in adults.

DR. HENRY M. GOODYEAR, Cincinnati: In 1925, I was very skeptical about the use of the middle meatus as a point for irrigation.

I am satisfied that to irrigate through the middle meatus is a delicate procedure and one that takes a lot of practice; that is, if you are going to use it as a routine measure. During the first two years, I probably used it in 30 or 40 per cent of cases, and in the last two years I would say that it was used in approximately eight out of ten cases.

When I say middle meatus, I am not saying normal ostium, because I realize that while we irrigate in eight out of ten cases (or seven or eight out of ten) through the middle meatus, perhaps in all of these cases the irrigation is not through the normal ostium; that is, at irrigation you sometimes see blood-stained fluid, which indicates that you have either traumatized the ostium to some extent or have punctured the membrane.

If I try to irrigate and find that the ethmoid infundibulum is very deep and the bone hard, I simply stop and do the irrigation through the inferior meatus.

DR. EDWIN MCGINNIS, Chicago: In Chicago there are a good many advocates of irrigation through the natural ostium of the antrum, but one of the physicians who is very skilful in that procedure presented a case before our local society in which he had had an accident from the irrigation. A physician's wife, for whom he irrigated the antrum through the normal opening, had a serious upset and finally hemiplegia developed, so that irrigation through the normal opening is not without danger.

DR. GEORGE B. WOOD, Philadelphia: I think that Dr. Walter Freeman was the pioneer in washing out all the sinuses through the accessory openings. He used for practically all his sinus washings through normal openings a flexible hard rubber cannula that he molded to fit each patient as he washed out the cavities. There was just one point in washing out the maxillary sinuses, and that is when there is chronic disease of the maxillary sinus that cavity is much more easily washed out than the normal maxillary sinus, either because of displacement of the uncinate process forward by polypoid material or possibly from the pressure of the purulent material inside of the maxillary sinus.

DR. HENRY H. FORBES, New York: I believe that the normal opening is the most satisfactory.

DR. JOSEPH C. BECK, Chicago: In regard to a statement made by Dr. McGinnis concerning an accident, I happened to be called in to see the physician's wife after the accident occurred. In this case it was quite easy to understand what followed the irrigation. A rubber bag was used for irrigation. It appeared to me that air had been forced into the antrum, in which there was probably a dehiscence. This patient was very ill for several weeks; in fact, she has not entirely recovered the use of her leg. A neurologist who was in consultation in the case thought that this complication was really caused by air that entered into the channel and the cerebrum.

DR. FIELDING O. LEWIS, Philadelphia: With respect to the entrance of air into the circulation, I happen to have witnessed an interesting and a rather enlightening example. Dr. Ziller, one of our pathologists, was preparing to make a transfusion into the vein. He had his own technician, a nurse, with him. They used one of the rotary pumps. At a certain stage, he noticed that something did not seem to be going right, and he found that the nurse was turning air into the vein instead of taking blood out of the vein of the donor, the air entering the vein of the recipient. He said that as near as he could estimate, about a pint and a half of air had already been injected. It happened that there was an ophthalmologist near. The patient seemed to be all right. The ophthalmologist was asked to examine the fundus, and he reported that he could see a parade of air emboli going through the veins of the fundus. The patient had no symptoms.

In our clinic we recently had a sudden death following irrigation of the antrum of a woman who had undergone irrigation under the same circumstances, by the same apparatus, by the same physician, six or eight times within the previous two weeks or so. This last time exactly the same procedure was carried out, but she fell dead. Of course, we had quite an analysis of the possible causes of death, and it was the impression of those who were particularly interested that it was very hard to believe that the air embolism had caused death.

DR. HENRY H. FORBES, New York: Was a natural orifice used?

DR. FIELDING O. LEWIS, Philadelphia: No, a puncture was made.

DR. EDWIN C. MCGINNIS, Chicago: I was glad to have Dr. Beck reinforce my statements. I did not bring up that case as a contraindication to irrigation through the normal opening. I just brought it up as a word of warning that this physician had been using this method for years, is very skilful and yet had an accident.

Dr. Grove, of Milwaukee, gathered together more than 100 cases of deaths following irrigation of the antrum in which air was used to blow out the fluid that was used in irrigating or was blown in to see whether the antrum cavity had been entered. At the sectional meeting of the American Medical Association in Philadelphia, some one said that he used a little air pressure when he went through the normal opening to know that he was in the antrum cavity. I warned everyone not to blow air into the antrum, because there have certainly been enough fatalities following this procedure.

DR. MERVIN C. MYERSON, New York: This anatomic study was done carefully and meticulously to give me and anybody else who might be interested a guide as to what to expect when we pass an instrument into the nose. I did not mean to give the impression that when we pass an instrument into the infundibulum we should deliberately hang over the uncinate and tear it away, but as a result of this study, one cannot help but conclude that we must pull the uncinate out of place, or perhaps even fracture it a good many times.

Regarding the types of instruments shown by Dr. Goodyear and Dr. Forbes, it is my feeling that one cannot enter more than 20 per cent of natural orifices with them. In the majority of instances, the middle meatus is punctured.

A SURVEY OF FACT AND THEORY IN THE FIELD OF OLFACTION. DR. ERNEST M. SEYDELL, Wichita, Kan.

Dr. Seydell made a survey of some of the theories and facts concerning the following phases of olfaction: the difference between the senses of smell and taste; olfaction in some of the lower forms of animal life; physiology of olfaction; acuity of the sense of smell; olfaction and ethnology; olfaction and medicine; olfaction and its relation to our likes and dislikes in foods; mental reactions resulting from olfactory stimuli.

DISCUSSION

DR. J. GORDON WILSON, Chicago: I had an example of sound producing smell. When the middle cord was struck, this patient always said that she had the smell of music. I never was clear whether she had the smell of music or whether it was a case of association of ideas. I was inclined to think that it was the latter.

I have always been led to believe that the olfactory mechanism in man is nutritional. Dr. Tilney, in speaking about Helen Keller, said that she was able to smell things perfectly distinctly. He found when testing her that her sense of smell was no better than the average sense of smell. In other words, she had cultivated a faculty that was associated with the sense of smell, and I believe that in man that is the thing one has to think of in such cases.

I believe that the taste buds at the back of the nose are perfectly developed in certain animals, are purely defensive mechanisms and are comparable to the buds that are found at the back of the epiglottis. We cannot very well test the taste buds in the nose to see what the reaction is, but we can test them in the epiglottis.

DR. HENRY L. SWAIN, New Haven, Conn.: I wonder if all of you do not at times have a smell memory. When Dr. Seydell spoke about the odor of new-mown hay, I could smell new-mown hay. I cannot think of a case of ozena, but what I can remember is the horrid smell with which we are all so familiar. I have had people say in the night, "Don't you smell smoke?" and I can smell smoke in the night.

DR. ERNEST M. SEYDELL, Wichita, Kan.: I mentioned Helen Keller in the paper. I also mentioned a number of other remarkable facts. Some people are

able to recognize others by their sense of smell; the blind can frequently do this, and some authors even go so far as to say that they can determine by this odor whether the person is sympathetic with them and whether they are the type of person they want to associate with.

I believe, with Dr. Wilson, that these abilities are due to mental associations. In regard to smell memories, I covered that question rather thoroughly in the original paper, taking up the question of wine tasters.

The question of smoke at night brings up something I mentioned in my paper. Henning claims that if a meal is brought to you in the dark and these foods are foods that you are not accustomed to eating, you will not be able to recognize any taste, although the tactile sensation and other senses will not be impaired. He also claims that you cannot recognize white wine from red wine in the dark, and that the blind never smoke, because one cannot appreciate smoking in the dark.

ANGIOMA OF THE NASAL SEPTUM: CASE REPORT. DR. VIRGINIUS DABNEY, Washington, D. C.

The age of the patient (50), the pallor and the progressive weakness suggested the possibility of a malignant condition. However, a true angioma was found on microscopic examination. The well known tendency to return was not manifest, as two months after removal merely a fringe was found, and now, after four years, there is no sign of recurrence. An associated bronchial asthma of many years' standing has practically disappeared, beginning with removal, at which time hemorrhage was not great. It came from a small spurting artery and was easily controlled.

DISCUSSION

DR. JOSEPH C. BECK, Chicago: Angiomas of the septum, of which there are more than 100 cases reported in the literature, occur in a proportion of about 3:1 in women, and the tuberculum septi are the most frequent locations. They must not be mistaken even in the histology of microscopic examination. It is possible to make a mistake with the type of tumor known as the cavernoma, or dilated blood vessels, such as granulomas, which look and act very much like angiomas. These tumors have a tendency to recur. The cavernomas, by the way, have a predilection for the sinuses, especially the antrum of Highmore. I have one case under observation called angioma cavernosum that is really not a true angioma.

The point is that these tumors bleed periodically. There were cases reported, particularly one by Anton, in the *Prager medizinische Wochenschrift* in 1914. Anton described the case of a woman who could tell of pregnancies. He described the bleeding that recurred during pregnancy as one of the earliest symptoms; the patient foretold her early pregnancy by the nasal bleeding. This occurred two or three times.

The diagnosis is difficult because taking the specimens for biopsy is more serious than the operation on account of the hemorrhage.

DR. R. BISHOP CANFIELD, Ann Arbor, Mich.: Dr. Dabney's paper interests me because I have had under observation during the past two or three years three cases of persistent hemorrhage, uncontrollable by any method at our command. One of these cases is a true angioma cavernosum, and two of them demonstrate no microscopic pathologic change on the septum, one of these showing early microscopic evidence of the development of an angioma cavernosum, not demonstrable on ocular examination, and the other showing apparently an extreme fragility of the blood vessels of the septum at the characteristic bleeding point.

The only measure that seemed to interfere with the periodicity of the hemorrhage was the subcutaneous injection of pigeon's blood serum.

DR. JOHN B. POTTS, Omaha: Dr. Canfield's remarks interest me very much because for the last year and a half I have had a patient with a condition so nearly the same as that of the last patient he mentioned that it is unnecessary to

describe the case, except to say that she is an albino. She has a spontaneous nystagmus. The septum of the nose looks normal on inspection. There is not the slightest bit of thickening of the mucous membrane evident. I have tried all sorts of local applications with no success.

In regard to pigeon's blood, did Sayre bring that out? He wrote an article on the use of fresh pigeon's heart muscle applied directly to stop the bleeding, and I was just thinking that it was all in the same article.

CONGENITAL STENOSIS OF THE LARYNX. REPORT OF CASES. DR. LOUIS H. CLERF, Philadelphia.

Congenital stenosis of the larynx is uncommon. Its recognition is often delayed because of a confusion in diagnosis. Disturbances of breathing in the new-born are usually diagnosed as the result of enlargement of the thymus gland. A positive diagnosis can be made by direct laryngoscopy, and appropriate treatment can be instituted. Three cases of congenital stenosis were reported. Two of these occurred in infants and one in an adult. The symptoms, diagnosis and treatment were discussed.

DISCUSSION

DR. LEE W. DEAN, St. Louis: It seems to me that if we include the lesions of the larynx that cause marked expiratory stridor in the category of laryngeal stenosis, congenital stenosis of the larynx is not so rare.

I remember that last year we had one case of angioma of the larynx, one case of congenital web, two cases of elongated flaccid epiglottis, which during inspiration was drawn down into the chink of the glottis, and one case of long tapering arytenoids, which were sucked into the glottis during inspiration. We have seen at least two, and I think more, cases of unsuspected paralysis of the larynx. One congenital lesion of the heart was discovered as a result of examination of the larynx.

We saw one patient, an infant, with a congenitally small larynx, with fairly good breathing. The infant died of intercurrent disease. We obtained the larynx for examination.

As the larynges develop, most of the minor conditions of stenosis of the larynx disappear.

DR. MERVIN C. MYERSON, New York: About a year and a half ago I was called to a hospital to examine a new-born infant. In this case I asked whether the baby had been subjected to instrumental trauma, and the obstetrician assured me that she had not.

In this case, direct laryngoscopy demonstrated a complete paralysis of the structures of the larynx. Tracheotomy was performed, but the baby died twenty-four hours later. Autopsy revealed an extensive epidural and subdural hematoma, mostly in the posterior fossa, which brings to the fore the fact that one must think of the possibility of intracranial injury causing laryngeal paralysis when one is considering this type of case.

Dr. Clerf's third case, that of an adult 39 years of age, makes me wonder whether it might not have been the end-result of a syphilitic lesion.

DR. LOUIS H. CLERF, Philadelphia: With regard to the cases of congenital laryngeal stridor, I do not believe that we can classify them as true cases of congenital stenosis, because they are largely a matter of deficiency, either in the normal stiffening of the laryngeal structure or in the elongation of the supports of the epiglottis, which permits it to fall back; in the majority of instances, these defects can be overcome. In other words, the patient will outgrow the defects after one or two years, and rarely is anything needed in the way of surgical intervention. However, in cases of congenital stenosis there is a definite tissue change, the result of abnormality, which necessitates removal in order to allow the patient to enjoy the normal functions.

With regard to the last patient mentioned, we thought of tuberculosis, syphilis and all of the other conditions that might cause laryngeal stenosis. Absolutely nothing was found in the routine examination of the patient to corroborate the diagnosis of syphilis. The behavior of the laryngeal lesion convinced me that it was not of cicatricial origin, for cicatricial stenosis of the larynx does not respond to treatment as promptly as this case did, and there was absolutely nothing about the appearance of the larynx to suggest that it might have been of cicatricial origin, so I feel convinced that it was a case of congenital stenosis.

SUDDEN BILATERAL PARALYSIS OF THE LARYNX IN TUBERCULOSIS: REPORT OF TWO CASES. DR. ROBERT M. LUKENS, Philadelphia.

Bilateral paralysis of the larynx in tuberculous laryngitis occurs infrequently. In the two cases reported, emergency tracheotomy was necessary. Both patients had been under treatment for a short period, with marked improvement. Following tracheotomy, local treatment was discontinued, but apparently, owing to the tracheotomy, both larynges were healed without local treatment. One patient died of a pulmonary involvement; the other one is still living; the larynx is healed, although the arytenoids are still fixed. The pulmonary lesion is much improved.

DISCUSSION

DR. EDWIN MCGINNIS, Chicago: Dr. Beck and I have one such case of bilateral abductor paralysis of the larynx in a tuberculous patient.

About ten years ago, I saw a woman, aged 25, with a markedly advanced pulmonary tuberculosis and an advanced laryngeal involvement, who was seven months' pregnant. She could hardly breathe. Both lungs were full of fluid. We thought that she would live for about two weeks.

Under local anesthesia, we performed a tracheotomy, and, to our surprise, in about ten days both lungs were dry, and the patient felt much better. On laryngeal inspection, we found that the larynx was commencing to heal. The epiglottis was about three times its normal thickness. The larynx was of the type that you would think would never come back to normal.

We entered the patient in the Municipal Tuberculosis Sanitarium, and that was the last I heard of her for about a year. I had the good fortune to be appointed consultant at this sanatorium, and at the first visit I made to the sanatorium, I received a note to see Patricia Lawler. She was the picture of health, and on questioning, I found that she had given birth to a healthy child. She was still wearing a tracheotomy tube, and the larynx was healed. Examination of the cords showed them to be in the midline position. The bowing that is present in certain types of paralysis of the larynx was not seen, but the cords were untensioned. When she corked her tracheotomy tube, she had difficulty in breathing.

I observed her for about a year, and we talked over various methods of decannulation. She wanted to get rid of the tube because she was an entertainer. She thought that there was something we could do so that she could breathe through her mouth in the normal way and still have a voice.

My idea is that in the healing of the laryngeal tuberculosis, the end of the recurrent nerves on each side probably got caught in the contraction of the scar tissue and so shut off the function.

DR. J. B. GREEN, Asheville, N. C.: The second case presented would seem to be a stenosis from scar tissue and infiltration in that region. The first case did not present such a lesion. The second type is rather more frequent when ulceration of the commissure and stenosis are present.

In a tuberculous case that I saw in my practice in 1921, obstructive symptoms of the larynx developed. This patient, a boy aged 18, had advanced pulmonary tuberculosis and a laryngeal lesion, evidenced by general redness of the larynx. Neither edema nor marked infiltration was present. Occasionally it was noted that the cords were closely approximated and did not separate on inspiration. Six

hours later it was noted that the obstructive symptoms had markedly increased. In making preparations to take the patient to the hospital for tracheotomy, I made the mistake of administering morphine, ¼ grain (0.016 Gm.). The obstructive symptoms suddenly became worse, requiring immediate intubation. The patient was promptly relieved of all obstructive symptoms, although he required reinsertion of the tube several times during the night.

The following morning tracheotomy was performed. This gave the patient relief for about six months, when death occurred from a pulmonary lesion.

This case is mentioned to indicate the danger of the use of morphine in such cases, which was emphasized by Jackson, and also the value of intubation in certain cases of laryngeal obstruction in tuberculous patients.

Dr. William V. Mullin, Cleveland: I offer the opinion, in regard to one of Dr. Luken's cases, that it is a chronic case of tuberculosis of the lungs which has broken down slowly and healed gradually, and that there was probably a mass of fibrous scar tissue in the mediastinum so that a displacement of the mediastinum took place either one way or the other, which at simultaneous times involved both the vagi. I offer as my explanation of Dr. McGinnis' case, that both recurrent laryngeal nerves were injured and the cords moved up to the midline and remained there.

Dr. Henry L. Swain, New Haven, Conn.: This illustration depicts a specimen of an infiltrating lesion of the larynx from a patient with typhoid. The patient had a marked inspiratory and expiratory stridor. A tracheotomy was performed. The patient apparently was recovering, but died of a hemorrhage, a week or so afterward.

Dr. Robert M. Lukens, Philadelphia: Both patients were cured following tracheotomy, but no medical or surgical treatment of the larynx was carried out. Some physicians have advocated tracheotomy as a therapeutic measure for tuberculosis of the larynx to induce complete rest. I once had occasion to do a tracheotomy on a patient with tuberculosis of the larynx, not as a therapeutic measure, but to relieve stenosis caused by large tuberculous infiltrations of the larynx. This patient had very active tuberculosis with a great deal of sputum; the wound became infected, the dressings were always wet, or dry and hard, and every time the patient coughed there was a regular shower of dried tuberculous sputum.

In the second case I reported, the patient had an infected tracheotomy wound, although she took care of herself thoroughly, and there was none of the discomfort or the trouble that was present in the other one. Therefore, I would not advise tracheotomy as a therapeutic measure for tuberculous laryngitis in patients who are expectorating.

Bilateral Abductor Paralysis: Operative Treatment by Submucous Resection of the Vocal Cords. Dr. W. B. Hoover, Boston.

The material was based on a review of the literature and a study of seventeen cases that had been seen in the Lahey Clinic. Some of the probable causes of bilateral abductor paralysis were discussed; the laryngeal findings were mentioned, some of the operative treatments were considered, and a method of submucous resection of the vocal cords was presented.

DISCUSSION

Dr. Joseph C. Beck, Chicago: The difficulties that Dr. Hoover described are on the increase, or have been in the past ten, fifteen or twenty years, on account of the most frequent cause, namely, operations on the thyroid gland.

When cordectomy was first suggested, I had the opportunity of doing a resection of the cord by the direct method. I have seen nothing but the best results from that procedure, as I am very definite and persistent in the after-treatment to

prevent adhesions. When one considers what a patient can do with her voice without the larynx or after hemilaryngectomy, one appreciates the good compensatory action of a laterally resected cord.

DR. EDWIN MCGINNIS, Chicago: A patient on whom I did a cordectomy has as good a voice as she ever had. I watched her phonate with the direct laryngoscope and also with a mirror, and I found that she was getting a vibration of the aryepiglottic folds. She has no difficulty with her voice.

DR. R. BISHOP CANFIELD, Ann Arbor, Mich.: We have never satisfactorily repaired postoperative paralysis of both cords by cordectomy. We have seen temporary and very good results follow it, but the ultimate result has always been a return to the unsatisfactory condition present before the cordectomy. Ultimately, the contracture of the larynx has seemed to be greater than before we made an effort to correct it.

Our efforts, then, with cordectomy for the correction of this bilateral paralysis have resulted in failure.

I should like to hear from Dr. Hoover a discussion of the character of the voice permanently secured after this operation has been successfully performed.

DR. LOUIS H. CLERF, Philadelphia: Dr. Hoover very well described the symptoms that these unfortunate patients present, notably the marked dyspnea. We as physicians are, of course, interested in relieving the dyspnea, and when we present some of our plans of procedure, the patients immediately ask what effect this will have on the voice. If you tell them that you are going to disturb their voice seriously, they are not particularly enthusiastic.

DR. WILLIAM V. MULLIN, Cleveland: There is nothing that parallels this condition, because in any other condition in which you insert a tracheotomy tube, you of course stop the voice unless the tube is plugged up, but not so in bilateral abductor paralysis. A tracheotomy tube is inserted, and the patients have a good breathing way, being relieved of that distress, and yet they have a good voice. The best we have been able to offer for these patients has been a good tube. We send them to the jeweler and have the tube made in the form of a lavaliere, so that it is not so unsightly, and we give them good breathing and a good voice.

DR. ARTHUR W. PROETZ, St. Louis: I should like to ask Dr. Hoover whether it is difficult to elevate the membrane and whether in any of his cases he has had an accidental perforation; if so, what has been the result?

DR. FIELDING O. LEWIS, Philadelphia: May I ask Dr. Hoover whether in his experience the monolateral submucous resection has been sufficient to give him adequate space in the average case, or whether it is necessary to do a bilateral resection?

DR. GABRIEL TUCKER, Philadelphia: This tracheotomy tube has a valve attachment, which permits inspiration through the tube, but expiration through the larynx.

DR. ROBERT SONNENSCHEIN, Chicago: In the submucous removal of the larger portion of one thyroid alae, in doing a hemilaryngectomy after the method of Sir St. Clair Thompson in which removal is quite easy, could you not in this instance, instead of doing the submucous resection of the cord, merely remove a considerable portion of the thyroid alae and then allow the soft tissue to fall laterally and thus produce a larger airway than mere resection of the cord itself and possibly obviate the necessity of operating on the other side?

DR. JOHN B. POTTS, Omaha: I should like to ask about the present status of anastomosis of the nerves.

DR. W. B. HOOVER, Boston: The length of my experience with this operation is two years. I have performed the operation in four cases. In the first case, I resected only one vocal cord, and the patient has gotten along very well. She does not have a good voice, but a hoarse whisper, yet is able to make any one in a room or across a room understand her without any difficulty.

In the second case, the patient had had an operation previously that had failed; a portion of the cartilage in front had been removed. The larynx was narrower

than the normal larynx; therefore, I removed a portion of each cord. This patient has a voice that she describes as practically as good as she ever had. Her voice is hoarse and husky; she cannot sing, but she is able to talk loudly.

One of the other two cases occurred in a woman with myxedema of the larynx as well as other evidences of myxedema. I did a submucous resection on both sides because of the great amount of soft tissue in the larynx.

In the fourth case, I did a submucous resection on one side only and secured an ample airway. This patient had had nothing done to her larynx beforehand.

I am under the impression that any operation that causes considerable separation of the vocal cords so that they cannot get together will leave a difficulty in speech.

I do not urge this operation unless the patients are very dissatisfied with the tube.

To avoid perforating the mucous membrane, sharp dissection should be used.

In regard to the removal of the cartilage of the thyroid with the expectation of the soft tissues of the larynx falling laterally, it would be my expectation that instead of falling laterally they would fall medially and perhaps cause more trouble instead of less trouble.

In regard to anatomosis of the nerves, we attempted this in some of our cases.

Book Reviews

THE DISPLACEMENT METHOD OF SINUS DIAGNOSIS AND TREATMENT. A PRACTICAL GUIDE TO THE USE OF RADIOPAQUES IN THE NASAL SINUSES. By ARTHUR W. PROETZ, A.B., M.D. Price, $6. Pp. 242, with 146 illustrations and a chart. St. Louis: Annals Publishing Company, 1931.

This work has been awarded the Casselberry prize by the American Laryngological Association. It is a scholarly presentation of the use of radiopaques in sinus study in which the author gives in much detail his method of replacing the air in the paranasal sinuses by radiopaque substances. The author demonstrates the use of these substances in a study of the anatomy of the sinuses and claims for this method valuable aid in the diagnosis of sinus disease as well as in the treatment for sinus disorders. The claim is made that a failure to fill the sinus by his displacement method is an important aid in diagnosing sinus disease; also delay in emptying a sinus in which radiopaque substances have been introduced is claimed to have important clinical significance. The author insists that irrigation of a sinus previous to the introduction of radiopaques is not permissible, and he states that where irrigation has to be resorted to, twenty-four hours must be allowed to elapse before the introduction of the radiopaque solution. It might be pointed out that many, perhaps most, rhinologists do not consider a sinus disease that runs its course without secretion as having, as a rule, any important clinical significance. A delay of twenty-four hours after irrigating the pathologic secretions from a sinus can mean only the refilling of the sinus again with pathologic secretions which would seem to have exactly the same objection as does the presence of irrigation fluid.

The author reports cases in which a diagnosis of sinus disease rested on the delayed emptying of a sinus after the introduction of radiopaques and in which intractable headache was cured by one or several fillings of the suspected sinus with these or other solutions. He also reports the cure of headache following intranasal operations in which the diagnosis of sinus disease also rested on the phenomenon of retarded emptying. The absence of any more palpable evidences of sinus disease subjects this method of treating headache to the same criticism that has been applied to much of the work that has been done on the sphenopalatine. As a matter of fact, the cure of symptoms, particularly the symptom of headache, has been claimed for various intranasal treatments. These symptoms have been attributed now to nasal reflex neuroses, again to supposed vacuum in the sinus and then to sphenopalatine neuralgias. The author of the displacement method finds in a sinus which fails to clear itself promptly of a radiopaque solution the basis for this symptom of headache. In view of these past experiences, it is not surprising that the rhinologist inquires, what are the more palpable evidences of local disease in these patients who are cured of headaches by intranasal manipulations? There are so many causes for the symptom of headache other than sinus disease that one may safely say that most headaches have nothing to do with sinus trouble.

The author illustrates the text by the reproduction of numerous roentgenograms. These illustrations, on the whole, are rather disappointing, owing, no doubt, partly to the difficulty in reproducing roentgenograms successfully.

The author has developed a new technic for the introduction of radiopaques in the study of nasal sinuses. The final evaluation of the use of these substances in sinus work has not as yet been reached. There are some who are optimistic and believe that we have here a method of considerable clinical importance; on the other hand, there are those who see in the use of radiopaques very little additional information that has practical clinical significance.

DIE MEDIKAMENTÖSE UND ALLGEMEINE BEHANDLUNG DER OHRENKRANKHEITEN. By DR. CONRAD STEIN, Vienna. Price, 6.90 marks. Pp. 103. Berlin: Julius Springer, 1931.

This is a monograph of 103 pages. The importance, in the treatment for diseases of the ear, of considering the general condition of the patient and other disease processes than that located in the ear needs no special emphasis. The author has endeavored to cover the subject of the treatment for certain diseases of the ear along the line of internal medicine, especially the general therapeutic measures in support of local treatment. A fair idea of the scope is had by looking over the table of contents. He includes in his survey diseases of the outer ear: eczema, furunculosis, recurring accumulations of cerumen; diseases of the middle ear; chronic adhesive processes of the middle ear, inflammatory diseases of the middle ear, the intracranial complications, such as sepsis of otologic origin, and meningitis; the treatment of the diabetic patient before and after operation, tuberculosis of the middle ear; diseases of the internal ear: the constitutional diseases affecting the internal ear, including otosclerosis and chronic progressive nerve deafness. Stein devotes a chapter to the medicinal treatment for subjective noises in the ear and the general treatment for aural vertigo, one to angiospastic aural pain and neuralgic aural pain, and one to psychotherapy, the syphilitic diseases of the ear, including the diseases of the outer and middle ears as well as syphilitic diseases of the internal ear, toxic neurolabyrinthitis, and diseases of the ear in cretins.

Directory of Otolaryngologic Societies *

NATIONAL

American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Gabriel Tucker, Bronchoscopic Clinic, Hospital of the University of Pennsylvania, Philadelphia.
Secretary: Dr. John J. Shea, 1018 Madison Ave., Memphis, Tenn.
Place: New Orleans. Time: May 9-13, 1932.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. J. F. Barnhill, Miami Beach, Fla.
President-Elect: Dr. S. Hanford McKee, 1528 Crescent St., Montreal, Canada.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.

American Bronchoscopic Society

President: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.
Secretary: Dr. Richmond McKinney, 899 Madison Ave., Memphis, Tenn.

American Laryngological Association

President: Dr. George E. Shambaugh, 122 S. Michigan Ave., Chicago.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.

American Laryngological, Rhinological and Otological Society

President: Dr. Max A. Goldstein, 3858 Westminster Pl., St. Louis.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.

American Otological Society

President: Dr. David H. Walker, 101 Bay State Rd., Boston.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

New Zealand British Medical Association, Ear, Nose and Throat Section

Chairman: Dr. James Hardie Neil, Auckland.
Secretary: Dr. W. Gillies Borrie, Auckland.
Time: March 28, 1932.

SECTIONAL

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. F. M. Sulzman, 1831 5th Ave., Troy.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

New England Otological and Laryngological Society

President: Dr. Harry P. Cahill, 520 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. Lyman G. Richards, 319 Longwood Ave., Boston.

Pacific Coast Oto-Ophthalmological Society

President: Dr. Chester H. Bowers, 1136 W. 6th St., Los Angeles.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.

Puget Sound Academy of Ophthalmology and Oto-Laryngology

President: Dr. Albert E. Hillis, 1115 Pacific Ave., Tacoma, Wash.
Secretary-Treasurer: Dr. Francis A. Brugman, 806 Cobb Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

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* Secretaries of societies are requested to furnished the information necessary to make this list complete and to keep it up to date.

SIOUX VALLEY EYE AND EAR ACADEMY

President: Dr. Claude T. Uren, City National Bank Bldg., Omaha.
Secretary-Treasurer: Dr. Frederick H. Roost, 420 Trimble Bldg., Sioux City, Iowa.
Place: Fontanelle Hotel, Omaha. Time: November, 1931.

SOUTHERN MEDICAL ASSOCIATION, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Fletcher D. Woodward, Box 162, University, Va.
Secretary: Dr. W. D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: New Orleans. Time: November, 1931.

SOUTHWESTERN MICHIGAN TRIOLOGICAL SOCIETY

President: Dr. C. W. Ellis, 215 N. Walnut St., Lansing.
Secretary: Dr. H. B. Weinburgh, 301 Seymour St., Lansing.
Time: Third Thursday of alternate months.

STATE

COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. F. J. Peirce, 511 N. Main St., Pueblo.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

CONNECTICUT STATE MEDICAL SOCIETY, SECTION ON EYE, EAR, NOSE AND THROAT

President. Dr. M. H. Merriman, 115 Prospect St., Waterbury.
Secretary-Treasurer: Dr. Walter L. Hogan, 750 Main St., Hartford.

EYE, EAR, NOSE AND THROAT CLUB OF GEORGIA

President: Dr. William L. McDougall, 50 Whitehall St., S. W., Atlanta.
Secretary-Treasurer: Dr. William O. Martin, Jr., 412 Medical Arts Bldg., Atlanta.

INDIANA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. John W. Carmack, 23 E. Ohio St., Indianapolis.
Secretary: Dr. J. Kent Leasure, 23 E. Ohio St., Indianapolis.

IOWA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Gordon F. Harkness, 215 Main St., Davenport.
Secretary-Treasurer: Dr. W. F. Boiler, 105 East Iowa Ave., Iowa City.

MICHIGAN STATE MEDICAL SOCIETY, SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Chairman: Dr. Wilfred Haughey, 303 Post Bldg., Battle Creek.
Secretary: Dr. H. O. Westervelt, 239 Pipestone St., Benton Harbor.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Douglas Wood, 74 S. 9th St., Minneapolis.
Secretary-Treasurer: Dr. W. E. Camp, Medical Arts Bldg., Minneapolis.

MONTANA ACADEMY OF OTO-OPHTHALMOLOGY

President: Dr. L. H. Huber, Livingston.
Secretary: Dr. A. W. Morse, Phoenix Bldg., Butte.
Time: Semi-annually.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. F. L. Wicks, Valley City.
Sceretary-Treasurer: Dr. W. L. Diven, National Bank Bldg., Bismarck.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. H. M. Hendershott, 193, 11th St.. Portland.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

RHODE ISLAND OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Raymond F. Hacking, 105 Waterman St., Providence.
Secretary: Dr. Herman A. Winkler, 224 Thayer St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

TEXAS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY

President: Dr. W. R. Thompson, 600 W. 10th St., Fort Worth.
Secretary: Dr. A. F. Clark, 414 Navarro St., San Antonio.

UTAH OPHTHALMOLOGICAL SOCIETY

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Erza Thompson Bldg., Salt Lake City.

VIRGINIA SOCIETY OF OTOLARYNGOLOGY AND OPHTHALMOLOGY

President: Dr. C. P. Jones, 3117 West Ave., Newport News.
Secretary-Treasurer: Dr. Henry Grant Preston, Harrisonburg.

WEST VIRGINIA STATE MEDICAL ASSOCIATION, EYE, EAR, NOSE AND THROAT SECTION

President: Dr. G. A. Smith, Montgomery.
Secretary: Dr. O. H. Bobbitt, Medical Arts Bldg., Charleston.

LOCAL

ACADEMY OF MEDICINE OF NORTHERN NEW JERSEY, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Charles W. Buvinger, 50 Washington St., East Orange.
Secretary: Dr. Earl LeRoy Wood, 192 Roseville Ave., Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. W. L. McDougall, 50 Whitehall St., S.W., Atlanta, Ga.
Secretary: Dr. William O. Martin, Jr., 412 Medical Arts Bldg., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: 8 p. m., last Thursday of each month.

BALTIMORE CITY MEDICAL SOCIETY, SECTION ON OTOLOGY AND LARYNGOLOGY

Chairman: Dr. William R. McKenzie, 11 E. Chase St., Baltimore.
Secretary: Dr. James J. Chisolm, Medical Arts Bldg., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

BUFFALO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. John F. Healey, 925 Delaware Ave., Buffalo.
Secretary-Treasurer: Dr. Herrmann E. Bozer, 468 Delaware Ave., Buffalo.
Place: Buffalo Club. Time: Second Tuesday of each month from September to May, inclusive.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. George J. Dennis, 25 E. Washnigton St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

CINCINNATI OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Edward D. King, 707 Race St., Cincinnati.
President-Elect: Dr. M. F. McCarthy, Union Central Bldg., Cincinnati.
Secretary-Treasurer: Dr. Samuel Seltz, Provident Bank Bldg., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. William V. Mullin, 9204 Euclid Ave., Cleveland.
Secretary: Dr. H. C. Rosenberger, 2064 E. 9th St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. Ralph Butler, 2007 Chestnut St., Philadelphia.
Clerk: Dr. Karl M. Houser, 1826 Pine St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Columbus Ophthalmological and Otolaryngological Society

Chairman: Dr. Ivor Clark, 188 E. State St., Columbus, Ohio.
Secretary-Treasurer: Dr. Francis W. Thomas, 327 E. State St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. L. M. Sellers, 717 Pacific Ave., Dallas, Texas.
Secretary: Dr. W. Mood Knowles, 1717 Pacific Ave., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6:30 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Detroit Oto-Laryngological Society

President: Dr. Raymond Goux, 1551 Woodward Ave., Detroit.
Secretary-Treasurer: Dr. R. Lee Laird, 513 David Whitney Bldg., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. J. J. Richardson, 606 Penn St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, 1304 Medical Arts Bldg., Fort Worth. Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. Claude C. Cody, 1306 Walker Ave., Houston, Texas.
Secretary: Dr. J. M. Robinson, Eye, Ear, Nose and Throat Hospital, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. B. J. Larkin, 23 E. Ohio St., Indianapolis.
Secretary: Dr. Kenneth L. Craft, 23 E. Ohio St., Indianapolis.
Place: Indianapolis Athletic Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. W. E. Keith, 1103 Grand Ave., Kansas City, Mo.
Secretary: Dr. O. S. Gilliland, Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. R. R. Montgomery, 102 Pine Ave., Long Beach, Calif.
Secretary-Treasurer: Dr. Russell T. Uhls, 823 Security Bldg., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. Eugene R. Lewis, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Hospital, assembly room. Time: 8 p. m., first Monday of of each month, May to November, inclusive.

Medical Society of the County of Kings, Section on Otolaryngology

Chairman: Dr. John M. Auwerda, 878 President St., Brooklyn.
Secretary-Treasurer: Dr. Charles R. Weeth, 37 Remsen St., Brooklyn.
Place: Library Bldg., County Society, 1313 Bedford St., Brooklyn.
Time: 9 p. m., second Wednesday of January, March, May and November.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. James A. Flynn, 1511 Rhode Island Ave., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St., N. W.: Time: 8 p. m., third Friday of each month.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

The Milwaukee Oto-Ophthalmic Society

President: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. Hilliard Wood, 700 Church St., Nashville.
Secretary-Treasurer: Dr. H. C. Smith, Medical Bldg., Nashville.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

New Orleans Ophthalmological and Otological Society

President: Dr. W. R. Buffington, 211 Camp St., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. John M. Loré, 240 West End Ave., New York.
Secretary: Dr. Robert E. Buckley, 2 E. 103d St., New York.
Place: 103d St., and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. W. P. Haney, 107 S. 17th St., Omaha.
Secretary-Treasurer: Dr. W. A. Cassidy, 1620 Medical Arts Bldg., Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7 p. m., third Wednesday of each month from October to May.

Philadelphia Laryngological Society

President: Dr. Arthur J. Wagers, 1429 Spruce St., Philadelphia.
Secretary: Dr. Herman B. Cohen, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

Pittsburgh Otological Society

Chairman: Dr. James Homer McCready, 121 University Place, Pittsburgh.
Secretary-Treasurer: Dr. Roy C. Cooper, 510 S. Aiken Ave., Pittsburgh.

Richmond Ophthalmological and Oto-Laryngological Society

President: Dr. Emanuel U. Wallerstein, Professional Bldg., Richmond, Va.
Secretary: Dr. William R. Weisiger, Medical Arts Bldg., Richmond, Va.
Place: Westmoreland Club. Time: 6 p. m., second Monday of each month from October to May.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. Clyde Heatly, 11 N. Goodman St., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 S. Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. Arthur W. Proetz, 3720 Washington Blvd., St. Louis.
Secretary: Dr. B. J. McMahon, 813 Missouri Bldg., St. Louis.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. Scott Applewhite, 706 Medical Arts Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. E. D. Dumas, 425 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

San Francisco County Medical Society, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Wilber F. Swett, 490 Post St., San Francisco.
Secretary: Dr. Robert Carson Martin, 384 Post St., San Francisco.
Place: Society's Building, 2180 Washington St., San Francisco. Time: Third Tuesday of every month except May, June, July and December.

Shreveport Eye, Ear, Nose and Throat Society

President: Dr. Claude L. La Rue, Highland Clinic, Shreveport, La.
Secretary-Treasurer: Dr. W. L. Atkins, 505 Medical Arts Bldg., Shreveport, La.
Place: 1240 Texas Ave. Time: 7:30 p. m., first Monday of each month from October to June.

Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. Paul A. Remington, Old National Bank Bldg., Spokane, Wash.
Secretary: Dr. Louis A. Parsell, Paulsen Medical and Dental Bldg., Spokane, Wash.
Place: Paulsen Medical and Dental Library. Time: 8 p. m., fourth Tuesday of each month except June, July and August.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. M. G. Brown, 713 E. Genesee St., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

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CONTENTS

PAGE

The Production of Voice and of Speech Following Total Laryngectomy: Exercise and Practice for the Production of the Pseudovoice. W. Wallace Morrison, M.D., New York 413

The Rôle of Chronic and of Subacute Infections in Diabetic Children. D. M. Lierle, M.D., and J. J. Potter, M.D., Iowa City 432

The Relation of Clinical to Bacteriologic Observations in Normal and in Diseased Maxillary Antrums. Frederick B. Balmer, M.D., Chicago 440

Plastic Surgery of the Nose. Lyndon A. Peer, M.D., Newark, N. J. 462

Retropharyngeal Abscess: Newer Methods of Diagnosis and Treatment. Fletcher D. Woodward, M.D., University, Va. 467

Myringitis Bullosa: Report of Two Cases. Edward F. Ziegelman, M.D., San Francisco 472

Clinical Notes:

Acute Frontal Sinusitis, Orbital Cellulitis, Osteomyelitis and Abscess of the Brain, with Recovery. Charles C. Wolcott, M.D., Yonkers, N. Y. 476

An Improved Bronchoscope and Esophagoscope. Sidney Israel, M.D., Houston, Texas 479

Technic of Correcting Nasal Deformities. Edward King, M.D., Cincinnati 483

Progress in Otolaryngology. A Summary of the Bibliographic Material Available in the Field of Otolaryngology: Acute and Chronic Otitis Media and Sinus Thrombosis. Samuel J. Kopetzky, M.D., New York 489

Abstracts from Current Literature 512

Society Transactions:

American Laryngological Association 525

Book Reviews 543

Directory of Otolaryngologic Societies 545